APRIL, 1953

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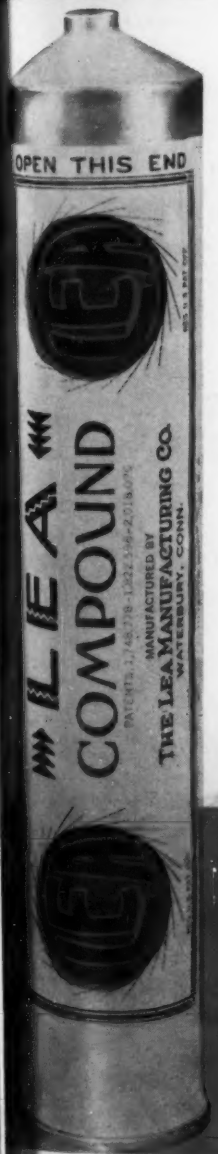

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A.E.S. Convention News • Peeling of Nickel Deposits • Comments on Silver Brightener • Arrow Plating Denver Facilities • Chromium Diffusion for Corrosion & Abrasion Resistance • Control of Phosphating Solutions • Calculation of Plating Thicknesses

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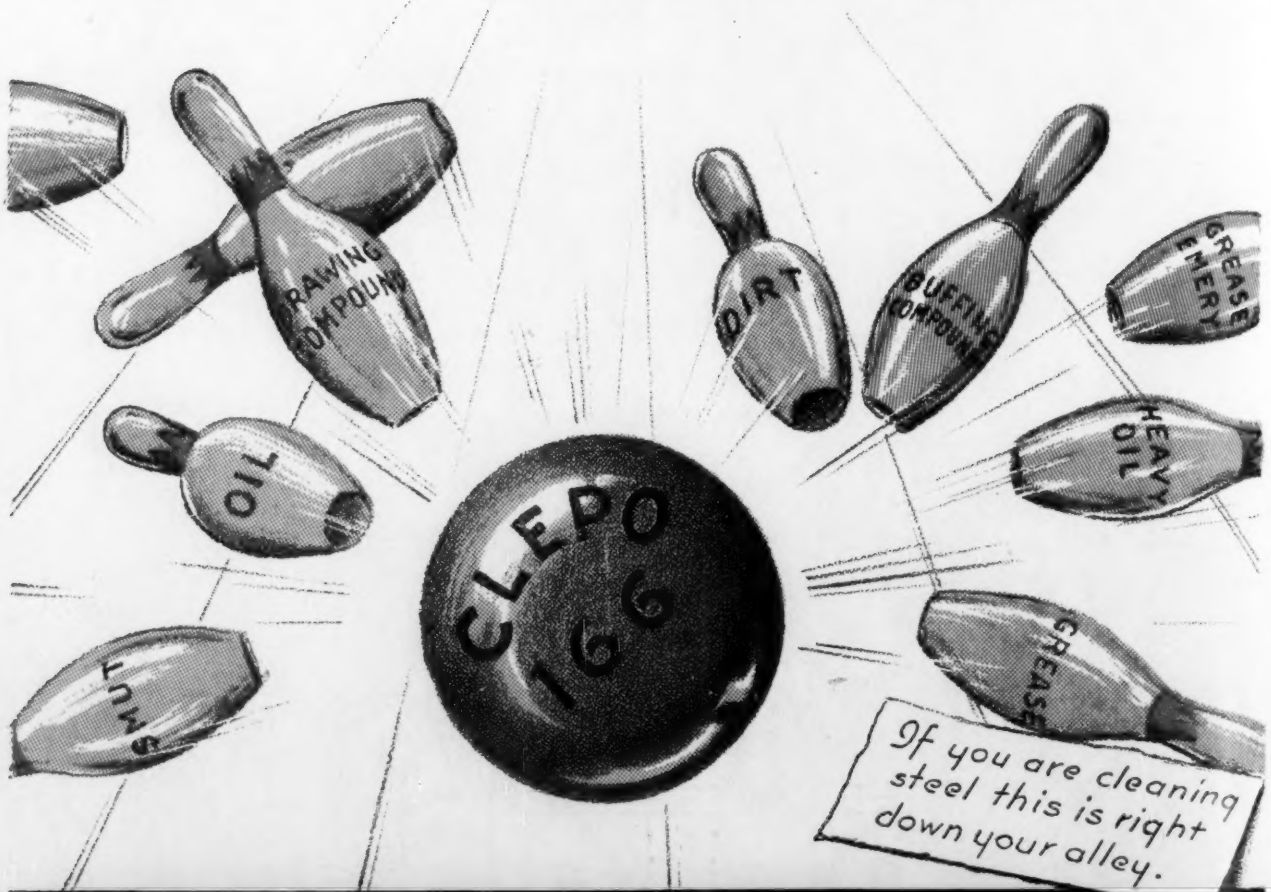

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The history of analytical control of plating solutions from the personal experience of George B. Hogaboom.

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The WASHINGTON OBSERVER

Charles A. Ceremi

News and Views from The Nation's Capital

. When CMP ends on June 30th, a modified allotment system (nicknamed "Little CMP") will continue. Third and fourth quarter allotments have already been cancelled for all commodities except nickel stainless and the quota on this item has been raised from 80% of the 2nd quarter allotment to 100%.

. NPA has lifted inventory restrictions on boron, calcium and ferro-silicon. Nickel in powder form is removed from M-80 coverage. The small-user exemption on silicon has been upped from 15 to 50 tons per month. Platinum recovered from jewelry, jewelry parts, scrap or sweepings may now be used by processors in the manufacture of items on List A of M-54.

. The Bureau of Mines reports that shipments of all lead and zinc pigments and zinc salts dropped substantially in 1952, as compared with the previous year. The greatly increased production of these two principal pigment materials brought about a drop of more than 20% in the price of common lead and a drop of about 30% in the slab zinc price.

. A goal of 359 million pounds of graphite annually has been set by NPA as its production objective. The Industry Advisory Committee of Artificial Graphite Producers met with Government officials and this goal was set for 1954. It was estimated that the balance between supply and demand will be good in the foreseeable future, for both graphite and carbon.

. U.S. consumption of refined copper and copper scrap was 2,188,000 short tons in 1952. NPA explains that a high import rate (120,000 short tons in the fourth quarter) plus heavy domestic production made this possible. Refined copper may now be purchased without regard to the "60% domestic - 40% foreign" split.

. The 1952 edition of the National Bureau of Standards' Annual Report contains summaries of scientific and engineering investigations on metallurgy and mineral products, among others. Priced at 30 cents, it may be ordered from the Government Printing Office, Washington 25, D. C.

. Metallic cadmium production, primary and secondary, increased by 25% in U.S. plants during December, 1952, as compared with the preceding month. Simultaneously, imports declined by one-third from the record November figure of 251,610 pounds. Stocks of cadmium metal held by producers and dealers at year's end were 1,853,563 pounds, or 54% higher than the 1951 mark.

. A booklet entitled "Small Business Production Pools for Defense" may be obtained free from the Small Defense Plants Administration, Washington 25, D.C., or from your nearest SDPA field office. Basic information concerning the laws governing the pooling of facilities, finances and skills in order to compete with larger organizations is contained.

. Another small business development is the increase in the number of SDPA representatives throughout the country. Four more representatives have been stationed at Army, Navy and Air Force procurement centers to screen proposed contracts and earmark those suitable for award to small firms.

. As of March 17th, the few remaining price controls (steel, nickel mill products, machine tools, certain chemicals) were ended. Records of transactions made under price control must be kept until April 30, 1955; and prosecution of over 800 damage suits now pending will be continued.

. Predictions: Hardship cases in the electroplating field may get relief in the form of a special allocation of over 1 million pounds of nickel for this purpose in the second quarter. Allocations of copper raw materials may end soon.

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METAL FINISHING

End of Metal Quotas - Except Nickel

On June 30th, the *Controlled Materials Plan*, under which the Government has doled out the available supplies of aluminum, copper and steel for almost two years, goes out of existence and we venture to say that few tears will be shed over its passing. In its place we will have a very much milder control plan, to be known as the *Defense Materials System*, for the express purpose of assuring scarce materials for defense production.

Industry criticized the original plan almost from the beginning, claiming that military demands for metal were not sufficient to require a Government control system to insure adequate supplies of copper, steel and aluminum for the defense program. The validity of their criticism will become more evident as time passes.

The nickel situation is expected to remain critical, mainly because of jet engine requirements, so that this metal will continue under allotment authority for an indefinite period. However, due to the efforts of the *Electroplating Advisory Committee*, assisted in its collection of data by the *National Association of Metal Finishers* and other groups, NPA has recognized that the hardships under which the plating industry have been operating could be eased appreciably with a quantity of nickel too small to have any impact on the supply situation. It has been decided, therefore, to divert sufficient nickel in the second quarter of 1953 to relieve unusual hardship, the intention being to provide platers with sufficient metal to maintain operations at the minimum level.

Although, at this writing, no information has been furnished as to the actual percentage increase in nickel allocations, to the many of the approximately 4,000 electroplating concerns in the United States which require only very small quantities of nickel to continue in business, the news will be welcomed as an indication that someone in Washington is concerned about the problems of the little man.

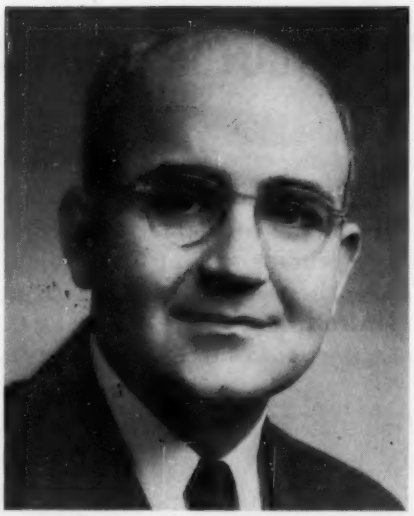
Nathaniel Hall

A.E.S. Convention Plans Move Into High Gear

PLANS for the *40th Annual Convention* of the *American Electroplaters' Society* are going ahead at a rapid pace, and there is every indication that, under the sponsorship of the *Philadelphia Branch*, this year's meeting will be an outstanding affair. The convention will be held at the *Benjamin Franklin Hotel*, Philadelphia, June 15 to 18 incl.

Arrangements are being made for the various branches to exhibit unusual and exceptionally interesting products, and an exceptionally fine program of technical papers has been prepared, some of which are as follows.

Chrome plating is to be the subject of a symposium conducted by *Dr. Richard M. Wick*, Bethlehem Steel Co., a member of the *Allentown-Reading Branch*. A paper by *R. Dow* and *J. E. Stareck, United* Chromium, will outline methods of overcoming the problem of producing truly crack-free chrome plate.



Dr. Samuel Heiman, General Chairman 1953 Convention Committee, has arranged an outstanding program of interest to all plating executives.

Martin F. Quaely, Westinghouse Research Department, will present a paper on "Black Chromium-Base Electroplating." This will explain how to obtain black finishes which have good adhesion to the base metal and which will withstand heating under high vacuum to temperatures of over 900°F.

The problem of cost estimates is frequently a nightmare to jobbing platers, and has been known to deter them from submitting bids on chrome plating jobs. *Messrs. Walton* and *Lonsberry* will present a fool-proof method of preparing such cost figures with a high degree of accuracy.

Members of the Ladies Committee have planned an interesting program of entertainment for visiting ladies. Members are, left to right, standing: Mrs. I. W. Marcovitch, S. Heiman, W. A. Reynolds, G. M. Long, F. Fulforth, E. F. Ottens. Front row: Mrs. C. E. Boerckel, A. G. Snow, D. R. Robson (Chairman), E. R. Lanahan, A. H. Pope.

CONVENTION HEADQUARTERS

The Benjamin Franklin Hotel which is located in downtown Philadelphia.

Delman R. Robson, Convention Committee Co-Chairman assures all members that it will be well worth their time to attend.

Frederick Fulforth, Educational Committee, has many excellent technical papers ready for presentation at the technical sessions.

Chromium recovery through ion exchange is a matter of growing interest and will be the subject of a paper by *C. F. Paulson*, Permutit Co. He will discuss a treatment which employs a new cation exchanger, effective in solutions containing up to 40% CrO_3.

Doctors Meyer, Serfass, and *Muraca* are to submit a paper dealing with the factors which cause the loss of cyanides, and those which minimize it.

The evaluation and effect of carbonate removal methods will be covered by *R. Scott Modjeska*, of Scientific Control Laboratories.

Walter Pinner, already well known for his work on the effect of abrasive metal polishing, will present new material concerning his findings on the influence of polishing on the quality of the final plate.

Molybdenum has poor oxidation resistance at elevated temperatures and must be protected by a thin protective plating. How this can be done will be explained by *Al Korbelak* of *Plating*.

A new electronic thickness gauge will be discussed by *Abner Brenner*. This is an instrument which should greatly simplify the ever important problem of determining plate thickness.

In the same vein, *C. F. Waite* of King-Seeley Corp. will outline the procedure, and will describe the equipment required, to determine the thickness of chrome plate by the anodic solution method. Of special interest is the fact that this method is accurate for determining chrome thickness over copper.

Quality control is of little value if frequency of testing is too low and is burdensome if tests are run too frequently. *Ezra Blount* of Products Finishing will outline methods to determine optimum testing schedules for both solution control and finished product inspection. An important tool in these days of increasing competition!

The nickel situation is forcing many of us to resort to protective organic coatings. Being a novice in this field the average plater has had to rely rather heavily on information furnished by the supplier. This has not proven one hundred per cent satisfactory. The difficulty can be overcome through information given in the paper "Testing Procedure for Organic Finishers and Interpretation of Results" to be presented by *Hutchinson* of Glidden.

In keeping with the "what's new?" theme; Bright Gold plating will be discussed by *Edwin Rinker* of Sel-Rex.

Iron plating has been limited, to some extent, by the poor characteristics of the available plating baths. A newly developed alkaline iron plating bath appears to have overcome many of these difficulties. This bath is described in a paper by *Foley, Linford* and *Meyer*.

The symposium on Chromium Plating will include a discussion on "A Corrosion Study of Chromium Electrodeposits" prepared by *Brown* and *Hoover* of Udylite. This work is particularly interesting in that it discusses exposure tests of chrome plate on a variety of metals: a matter of strong interest in these days of substitute base plates.

The host chapter, Philadelphia, and the co-sponsors, Allentown-Reading and Lancaster are doing everything possible to insure the success of the meeting.

Metal Finishing Suppliers Ass'n.

The support of A.E.S. activities by the industry's manufacturers and distributors is extensive throughout the whole year, but is especially evident and instrumental in the success of each year's annual convention.

The Association's first activity will be the *Annual Fellowship Luncheon* on Monday, June 15, the first day of the convention, which is open to supply houses and all representatives catering to the industry.

That evening the M.F.S.A. will again sponsor the *Fellowship Open House Party*, which is always a highlight of the convention.

The golf tournament will be held at the *Merion Country Club* on Wednesday, June 17, again under the guidance of *Joe Duffy*, our perennial Golf Chairman.

A. P. Munning
President, Metal Finishing Suppliers Ass'n

Joe Duffy
Golf Chairman

Notes on the Peeling of Nickel Deposits

By Edmund T. Richards

AMONG the various defects of nickel deposits still besetting the plating industry despite immense technical and scientific progress, peeling frequently is the most exasperating. It is true that, quantitatively speaking, pitting often assumes a leading position, but peeling is, or can be, a product of so many factors and eventualities that it is usually most difficult of solution.

There are a number of contributary phenomena indicating probable fundamental causes of trouble, such as dark or dull deposits, streaked appearance, white or yellowish gloss, hardness and brittleness, etc. It is also important to note whether the nickel deposit comes off in large or small areas; whether it peels of its own accord or after heavy mechanical stresses; if peeling is a result of cracks or cuts; whether it is accompanied by other prime diseases such as pitting, blistering, etc.; whether it makes its appearance during the plating process or at some time afterwards or if polishing and buffing induced the peeling action. This list can be prolonged ad infinitum but it serves to show the complexity of the problems involved. It is the purpose of this paper to point out the most important reasons underlying this trouble and to show ways and means to avoid and counteract them.

In studying the fundamental reasons for the peeling of electrodeposits it is well not to lose sight of the two following principles: Electrodeposits are maintained on their base surfaces (1) by adhesion, (2) by the mechanical pressure of the deposits themselves which is governed by the tensile strength and elasticity of the films and by the type of their anchorage. This latter condition is best fulfilled if the plating embraces the entire body of an article or at least a sufficiently round surface to form a solid anchorage, while least favorable conditions are offered by straight surfaces without chances of anchorage, so that the power of adhesion represents the only force holding the deposits in place.

The degree of adhesion of a deposit to the base surface is determined by the following three main factors:

1. Condition, physical properties and degree of purity of the base surface.
2. Physical properties of the deposit.
3. Type of the mutual relations between deposit and base surface.

All factors acting against adhesion and surface pressure of the deposits induce peeling. Wherever the mechanical properties of the plating such as tensile strength, hardness, etc. are sufficient to counteract the pulling stresses and the other internal and external forces acting on the film at any one point, peeling is prevented. Where this is not the case, separation of the film is bound to be induced, especially if the additional force of adhesion is unable to maintain the deposit in its place.

Common external influences tending to overcome the tensile strength of the deposits are bending stresses (increasing the tensile stresses beyond the limits of tensile strength), cuts or cracks in the film, pores or similar surface faults (interrupting the cohesion of the film), inclusions and trees on the surface of the deposits (torn or cracked off during polishing), sharp edges or corners beneath the films (tending to cut through the stressed deposits from beneath), reduction of the original degree of adhesion by corrosion effects, etc. The higher the degree of ductility and tensile strength of the deposits and the less pronounced the external contrary forces, the smaller the chances of peeling. The thicker and heavier the deposits the more pronounced are the favorable and unfavorable factors within the deposits in contrast to the influence of adhesion.

In studying the causes, symptoms and cures of peeling of nickel deposits, the following three viewpoints may be maintained:

Classification

I. Classification of the causes in accordance with the steps of the cycle involved:
   - a) Cleaning (and rinsing)
   - b) Pickling (and rinsing)
   - c) Nickel plating (and rinsing)
   - d) Buffing
   - e) Handling of the plated articles.

II. Study of the causes of peeling themselves:
   - a) Adsorption of hydrogen during pickling, electrolytic cleaning and nickel plating.
   - b) Faulty cleaning of the base surfaces.
   - c) Faulty rinsing after cleaning or pickling.
   - d) Metallic impurities in the electrolytes:
     - d-1) Iron
     - d-2) Zinc
     - d-3) Cadmium
     - d-4) Lead
     - d-5) Aluminum
   - e) Chromic acid in the bath.
   - f) Excessive concentration of organic acids.
   - g) Excessively high or low pH values.
   - h) Organic impurities.
   - i) Addition of oxidizing agents.
   - j) Incorrect operating temperatures.
   - k) Excessive concentration of nickel salts.
   - l) Excessive concentration of conducting salts.
   - m) Cyanide contents.
   - n) Excessive current densities.
   - o) Excessive deposit thickness.
   - p) Presence of oil and other impurities on the surface of the bath.
   - q) Too much brightening agents.

r) In the case of the nickel plating of zinc: insufficiently thick intermediate copper deposit.
s) Pores, pits, inclusions, treeing, etc. in the deposits.
t) Excessive buffing (local thinning and weakening or overheating of the deposits).
u) Excessive bending of plated articles, or other excessive stressing of the deposits by mechanical means.

III Study of the symptoms:

a) The deposit is dark and peels.
b) The deposit appears normal but peels.
c) The deposit is bright and hard and peels.
d) The deposit can be pulled off.
e) The deposit peels or flakes off on the lower portion of the articles, but is satisfactory on the upper portions.
f) The deposit comes off in small flakes.
g) The deposit cracks and peels on bending.
h) The bright deposit exhibits dark spots and peels.
i) The deposit is dull and peels.
k) The deposit is discolored, spotty and streaky, etc.
l) The deposit develops long, thin grooves and peels.

It would lead too far to discuss the causes and symptoms of peeling and flaking of nickel deposits in accordance with the steps of the entire process as per section I-a to I-e which has been the subject of innumerable technical articles and papers in technical literature (a number of which are cited in the attached review of literature). It is the purpose of this present paper to discuss the causes, the errors themselves and the cures suggested.

Adsorption of Hydrogen During Cleaning, Pickling and Plating

Pickling of iron and steel surfaces with acids or acid solutions, especially with the sulphuric and hydrochloric acid solutions commonly employed for this purpose, liberates hydrogen gas as a reaction product of these processes. Part of the hydrogen adhering to the pickled surfaces in the form of bubbles is adsorbed by the iron, forming an alloy and inducing the well known phenomenon of pickling brittleness. This process reduces the degree of adhesion of the deposit, while the hydrogen gradually released by the iron during and after plating tends to deteriorate the physical properties of the nickel deposits, inducing peeling and flaking.

Movement of the articles within the pickling solution counteracts the attachment of hydrogen bubbles and thereby reduces the amount of hydrogen adsorbed by the iron, although the most effective means of attaining this end is the addition of suitable inhibitors which, on account of their surface-active influence, cause a considerable reduction of hydrogen adsorption.

The same applies to *cathodic electrolytic pickling*, although much lesser quantities of inhibitor are required in this process. While, in the case of ordinary pickling, the quantity of inhibitor required averages about 0.05-0.10 percent, electrolytic pickling requires only about 0.0025-0.0050 percent of inhibitor. According to Machu, Ungersboeck et al., this applies to iron and steels of all kinds, steel alloys, anti-rusting steels, aluminum and light alloys.

It is obvious that the results of pickling are bound to turn negative if rinsing of the pickled articles is not carried out until the last traces of the pickling solutions are entirely eliminated.

The danger of hydrogen adsorption by iron and steel surfaces is equally large or even more pronounced during *cathodic electrolytic cleaning*. It is rather difficult to counteract this effect without reducing the technical and economic efficiency of the process, the only practical means of attaining a substantial reduction of this danger being the introduction of an effective preliminary cleaning treatment with boiling alkalies, with organic degreasers, etc. A preliminary treatment of this type is advisable, especially in the case of strongly profiled sections, since the throwing or depth effect of the electrolytic cleaning processes is not very pronounced. If this point is not sufficiently considered, the recessed portions of the articles frequently are not sufficiently degreased causing peeling or flaking, or at least a very harmful discoloration of the deposits at the points in question. Poorly saponifiable or emulsifiable fats require organic degreasing agents for the preliminary degreasing treatment.

The higher the current densities and the shorter the duration of the electrolytic part of the cleaning process, the smaller is the amount of hydrogen adsorbed. Apart from inducing excessive adsorption of hydrogen, comparatively long electrolytic treatments may also lead to the formation of large blisters. If electric cleaning is carried out by the "copper-cleaner process," leaving a fine film of copper on the degreased iron surface, the time of immersion of the articles must under no condition exceed 2 or 3 minutes (optimum period 1 to 2 minutes), since the copper film produced adsorbs a very large amount of hydrogen, which reduces the degree of adhesion considerably.

It is advisable that, after degreasing in alkaline baths or, if thin oxide-, sulphide- or carbonate films have formed on the degreased articles, previous to nickel plating — the articles receive a short dip (3-5 seconds) in a very dilute sulphuric acid solution (2 to 3 percent). It will be found that in practically all cases this short treatment will induce a considerable increase of the degree of adhesion.

It is a well known but frequently disregarded fact that the appearance of the surfaces to be nickel plated does not yield an unmistakable indication as to the state of cleanliness. Indeed, they may appear clean and bright, yet possess an invisibly thin but dense film of oxide or grease to render a perfectly adherent nickel deposit impossible. If the plating process does not follow directly after the pickling process, the above mentioned short dip should therefore be made a matter of routine.

The adsorption of hydrogen during *nickel plating* proper is usually induced by excessively high acid contents of the electrolyte and current densities but may just as well be caused by a number of other factors acting towards the development of considerable amounts of hydrogen at the cathode surfaces. The deposits then appear uncommonly bright, hard and brittle while, in some instances, such as with organic

impurities or excessive organic acids in the electrolyte, the deposits exhibit a more or less pronounced yellowish sheen. The countermeasure advisable must therefore be adopted only after careful study of all symptoms and phenomena; it is not always possible, for instance, to obtain good results merely by adding ammonia or nickel carbonate or any of the other basic substances calculated to reduce the degree of acidity of the electrolyte, as is frequently believed.

In the case of bright nickel deposits these symptoms may indeed be caused by a lack of acid in the electrolyte. If other symptoms or careful tests prove the presence of too much acid in these baths, nickel carbonate alone should be added to neutralize it.

The action of excessively high current densities in this direction need not be induced by an excessive input of current into the system. It is a matter of practical experience that this possibility represents a very rare cause of high current densities in the bath and that modern electrical control actually prevent it almost completely. In many cases this fault is due to an incorrect arrangement of the large and small anodes, insufficient conductance of one or the other anode or to any other of the numerous possibilties reducing the anode area required for correct current densities (See II-n).

Excessive generation of hydrogen may also be induced by low operating temperatures (II-j), insufficient concentration of nickel salts (II-k), excessive concentration of conducting salts (II-i), etc. The countermeasures required in these instances are self-evident.

Faulty Cleaning and Rinsing

The influence of faulty degreasing of the base surfaces on the degree of adhesion of the deposits is obvious. Since even the slightest films of fat, oil or grease of any type interrupt the metallic contact between the base surface and nickel deposits, perfect adhesion cannot be expected wherever the surfaces are contaminated with oily or greasy matter. The most adherent and most difficultly removable greasy impurities are usually those left on the metallic surfaces by polishing and buffing treatments, and it is frequently necessary to employ several degreasing treatments of different nature such as organic and inorganic or organic and electrolytic processes, frequently aided by mechanical treatment such as brushing, etc. to remove the last traces of these films.

Heavy films of grease covering a more or less extended area which, with even superficial care, should really be avoidable under all practical conditions, lead to a much earlier discovery of the fault than microscopically thin films which, while permitting the deposition of nickel, cause a corresponding reduction of adhesion, which sooner or later leads to peeling or scaling of the deposits. Films of this latter type are those frequently left behind by organic degreasing agents if the degreased articles are not sufficiently cleaned.

The appearance of nickel deposits suffering from this fault usually is quite normal, although in many instances they may develop a yellowish sheen. The appearance of this type of peeling phenomena may also yield definite indications since, if the surface contaminations are not uniformly distributed over the entire surface, the contaminated areas or spots will be shown up by the approximate shape of the peeling area, i.e. if the deposit comes off in thin strips or larger sections or if the oily contaminations of the base surface assert themselves in the form of pores, etc.

Attention must also be paid to the fact of whether the deposits come off at an early or later period; occasionally they commence to peel even within the plating bath or directly afterwards while in other cases they may stay unaffected for a considerable period of time, i.e. until the deposit is damaged or ruptured by bending or by sudden shocks or blows.

The importance and deteriorating influence of insufficient or faulty rinsing of the base surfaces after degreasing or pickling has been indicated in the foregoing section. It is not always a matter of organic impurities, of course, since inorganic substances adhering to the base surfaces may sometimes lead to interruptions of metallic contact and prevent adhesion of the nickel deposits at the points or areas of contamination.

Metallic Impurities

A very important and frequent factor influencing the peeling and flaking tendencies of nickel deposits is the presence of metallic impurities in the electrolytes, although authoritative opinions regarding the influence of the various metals in question have been considerably changed during the last few decades.

This applies particularly to the effects of iron salts in the nickel baths (II-l) which up to about twenty years ago were considered the chief reason for the peeling and flaking of nickel deposits. This view has been represented by authors such as Watts, Foerster, Mathers, Vuillemeur and others up to about 1923. More recent investigations conducted by American, British and German authorities such as Thompson, Bennett, Rose, Tinkler, Stuart, Sturdevant, Schloetter, Raub, etc. proved, however, that these deteriorating effects of iron salts assert themselves only if the pH values of the electrolytes are not maintained within the proper ranges. It was found that embrittling, peeling and flaking of nickel deposits cannot be observed within pH value ranges of from 3 to 6, the optimum range in this respect being 5.8 to 6.0. A very unfavorable range is that prevailing between pH 2.0 and 3.0, and it is probable that previous experiences with the unfavorable effects of iron contents of nickel solutions were made with solutions of this type, since comparatively small percentages of iron will then be found to induce peeling of the deposits.

It has also been found that, if nickel plating conditions are such as to precipitate basic iron salts in the electrolyte, these may drift to the cathode faces, causing the production of non-metallic inclusions and, consequently, of more or less serious porosity. The chief disadvantages of iron in nickel baths is the precipitation of iron hydrate, increasing the amounts of sludge and the difficulties introduced by it.

Attention must also be paid to the fact that if the amount of metallic iron precipitated along with the nickel exceeds 1.0 to 1.5 percent, the deposits become harder, brighter and eventually, more brittle than iron-free nickel deposits produced under similar operating

conditions, especially from baths of the same pH values, and that the general effects of these iron contents on the physical properties of nickel deposits, especially on the internal tension characteristics, resemble very much those exerted by hydrogen adsorbed by the deposits. If, therefore, the danger of peeling is introduced by other factors acting in the same direction, these iron contents may prove the final impulse leading to peeling or flaking of the deposits which usually is then charged to the iron contents exclusively.

It is possible, by the addition of organic or inorganic compounds forming complex combinations with iron, to prevent peeling of nickel deposits even in the presence of comparatively high iron contents from electrolytes of relatively low pH values (up to pH 4.0) while at higher pH values this influence becomes less pronounced. The most effective organic additions of this type appear to be citric acid and tartaric acid. Lactic acid, lactose and many other substances of the group are less suited for this purpose because of certain unfavorable effects on the electrolytes and deposits.

Iron compounds can be removed from nickel solutions by raising the pH to 6.3 by means of ammonia additions, filtering after about twelve hours of quiet standing and returning the pH to its normal figure. If organic impurities are also present besides iron, both types of contamination can be removed together by rendering the hot electrolytic slightly alkaline with ammonia or sodium carbonate solution, adding an oxidizing agent such as ammonium persulphate, heating the solution to boiling, cooling down to room temperature and filtering. The organic impurities can also be removed by acidifying the electrolyte to a pH value of 3.0, addition of permanganate (0.04-0.15 oz./gal.) and filtering after two days of quiet standing.

Zinc should not be present in modern nickel electrolytes. It is usually introduced by the anodes or, if the bath is also used for nickel plating zinc or zinc alloys. Characteristic indications of this impurity are the production of peeling deposits of darkly streaked appearance. The degree of adhesion of nickel deposits containing zinc is rather low in any case, even if the color of the deposit grows lighter with increasing current densities.

The removal of zinc from the electrolyte is effected most efficiently by raising the pH of the electrolyte sufficiently to precipitate a certain amount of nickel hydrate which tends to carry the zinc along with it. Ammonia, milk of lime or caustic soda are thus added until nickel hydrate commences to cloud the solution. After strong stirring the electrolyte is permitted to remain at rest for about 12 hours. The clear solution is then decanted off and the residue filtered. After cleaning the tank, the solution is returned and acidified back to its normal pH value. If iron and zinc are to be removed together, about 0.01 percent of hydrogen peroxide (30 percent) is added besides the alkali.

Cadmium is one of the very rare constituents unless intentionally added as a brightening agent (cadmium chloride or sulphate). Only very small quantities must be added for this purpose, however, since, after passing a certain low danger line, cadmium tends to produce discolored, stained or striped, brittle and peeling deposits resembling those containing zinc. The removal of this impurity is best effected electrolytically, using low current densities. High current densities do not accelerate results but lead to a pronounced loss of nickel. The voltage should not exceed 1.5. Best results are obtained if the electrolyte is slightly acidified with sulphuric acid. Copper is deposited along with cadmium.

Under practical operating conditions lead is found only in electrolytes of high chloride contents. It is practically insoluble in sulphate electrolytes. Occasionally it is found in electrolytes containing comparatively large percentages of organic acids such as citric acid which tend to produce easily soluble lead compounds, especially in new lead-lined tanks which have not had time to accumulate a sufficiently dense and protective film of lead sulphate. Very small percentages of lead tend to produce fine-grained bright nickel deposits, and it is for this reason that it is sometimes used in bright nickel electrolytes. The limiting value is very low, however; in most baths lead in amounts exceeding 0.001 or 0.002 oz./gal. is bound to lead to discolored, stained or streaky peeling nickel deposits.

Small quantities of lead can be removed by precipitation with sulphuric acid, filtration and readjustment of the original pH values by the addition of alkali. Relatively large percentages are best removed by electrolytic treatment of the solution at a pH of 4.0. The current density should be maintained at about 1 amp./sq. ft. Duration of the treatment, 30 to 40 hours.

Aluminum is a very rare impurity in nickel baths and is insoluble in most electrolytes of customary pH values. It is soluble only in relatively acid solutions (below pH 4.0) and tends to produce dark and easily peeling nickel deposits if present in very small percentages. Its deteriorating influence in this respect decreases with rising current densities, the same as in the case of zinc and cadmium.

Chromic Acid

Chromic acid additions are sometimes used to increase the gloss of nickel deposits. It is possible with chromic acid contents of only 0.004 oz./gal. to obtain very bright, but hard and rather brittle deposits. 0.004 oz./gal. of chromic acid induces a considerable increase in hydrogen development at the cathode while still larger percentages lead to peeling of the deposit. Hothersall and Hammond have found that electrolytes buffered with ammonium sulphate are less sensitive to this contaminant than those buffered with boric acid.

The removal of chromic acid from nickel baths is usually effected by the addition of ferrous sulphate solution amounting to 10 ozs. of ferrous sulphate per 1 oz. of chromic acid in the bath (as a 5-10 percent solution). After adding the ferrous sulphate, the pH of the solution is decreased to 3.0. It is then rendered alkaline with an excess of nickel carbonate, boiled and filtered.

Small percentages of chromic acid can frequently be removed from nickel baths by prolonged introduction of an air current into the electrolyte heated to 95-100°F. If the chromic acid contents do not exceed 0.001 oz./gal., 24 hours of this treatment will usually suffice to purify the bath.

(To be concluded next month)

Comments by Wood on Silver Brightener

I READ the recent article on silver brightener by Eaton, Fabian & Newton* with much interest and finally dug out some old data that it made me want to reconsider.

Over a period of several years, striving for moderately bright silver plate from 0.0002″ to 0.0012″ thick and using carbon disulfide, the average weight of sulfur added amounted to 0.01% of the silver deposited. As this is 20-30 times the amount found in the deposit by the radioactive tracer method; because the method of preparation was such as to minimize loss of sulfur before addition to the baths; and because no appreciable precipitation of AgS′ occurred in these baths (the prime on the S is used to disclaim the single sulfide and to cover any sulfide compound which could act similarly), it seems necessary to assume that most was lost by volatilization. This is not a new idea as, naturally, if 0.01% sulfur was present in a deposit the tracer method would not be needed to find it. It is interesting in a search for the mechanism of brighteners mainly because it strongly indicates that the active agent is odorless.

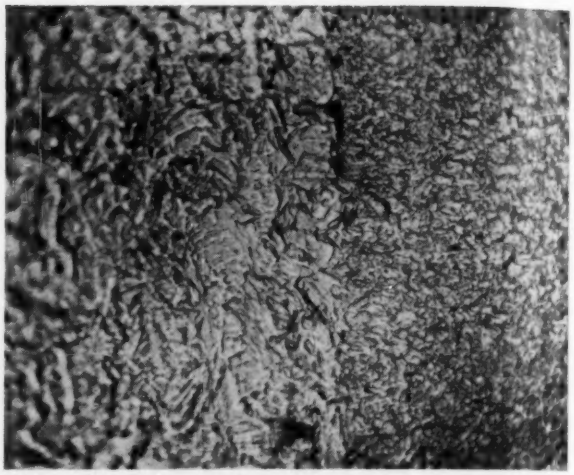
It does not seem necessary to know the exact chemistry of the brightening agent to arrive at a possible mechanism. An hypothesis adopted some years ago still appears tenable in the light of this new data and could be of interest to the authors of your article and, perhaps, generally. It assumes that, periodically or dispersely, the cathode surface is not silver but Ag_2S'. This film or these micelles of Ag_2S' must now be found to have a lattice sufficiently different from silver to refuse to have its geometry. The Ag_2S' is now assumed to be reduced, not too differently from the way the aluminum pan does it for the housewife, according to a reaction of this *type*:

$$2KOH + Ag_2S' + 2H^- = Ag + K_2S' + 2H_2O$$

When this reduction takes place, it is hypothesized that the positions of these silver atoms have been established in the Ag_2S' lattice and, because these positions are not "correct" for a silver crystal, normal growth is prevented.

The K_2S' is, of course, released in close proximity to other micro-areas of crystalline silver which it could immediately "tarnish." If this does not suit the thermodynamicists, it could diffuse away from the cathode and react, viz:

$$2KAg(CN)_2 + K_2S' \rightleftharpoons Ag_2S' + 4KCN$$



The reversibility of this *type* reaction is readily demonstrated and perhaps it is unnecessary to say that the tendency toward the right is increased by OH and decreased by CN. If a dispersion of solid Ag_2S' occurs according to a reaction of this type it is now subject to phoresis and is influenced by any of the ions in the bath. Migration and adsorption would now become additional possible ways by which Ag_2S' could appear on the cathode surface.

It is very probable that, under varying conditions of current density, bath composition, and diffusion-controlling factors, each of the possible mechanisms by which Ag_2S' could appear on the cathode, does occur. The ring patterns, well known to silver platers, frequently show four or five clearly distinguishable different "textures" and to plate so as to have only one type of brightener action requires careful engineering. Response of texture to potential gradients and to foreign or secondary ions also strongly supports this belief. The relative quantities of silver and Ag_2S' appearing at the cathode and the relative completeness of reduction of Ag_2S' before being covered with additional deposit would influence the texture of the deposit and also the residual sulfur in the deposit.

The fact that the authors of the article found sulfur on silver immersed in their bath without current would indicate simple "tarnish" or adsorption as the only reaction. Possibly it is the only one in the case of ammonium thiosulfate brightener, but when working with carbon disulfide over a period of several years, I frequently inferred a solid dispersion to be present when a solution was plating bright and determined

(*Concluded on page* 81)

*Radioactivity Helps Study of Silver Brighteners. *Metal Finishing*, **50**, 63 (Dec. 1952).

ARROW PLATING

Forty-Four Year Old Chicago Job Shop Now Operates in Five Integrated Buildings Covering More Than 30,000 Square Feet

DOUBLES FACILITIES

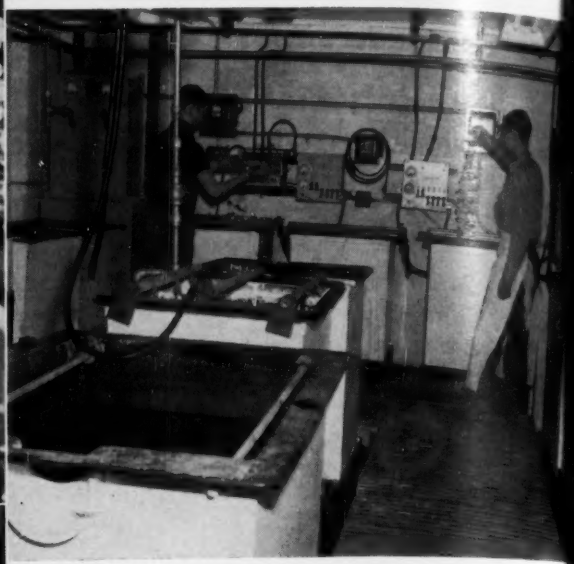
Arrow Plating Company's new plant in Chicago is a new concept in plating operation for the job shop. Quality and service are based on three essential factors: compartmentization of each type of plating or metal finishing operation, cleanliness equal to that of the best run home and control of quality by frequent testing of finished items and processing of solutions.

Figure 1. All the plating departments are served by one large polishing room. Photo shows a few of the sixteen lathes installed in this room, which is as dust free as is possible for any polishing room to be. Each lathe is connected to its own blower which in turn is exhausted to the roof.

Figure 2. The wheel room which services the polishing department is equipped with a wheel dresser. The humidity and temperature are controlled and regulated to prevent wheels from drying out and cracking.

Figure 3. From the polishing department, the parts are sent to individual degreasers prior to being racked. All racking is done on tables with storage provided for finished and unfinished parts.

Figure 4. Below: Precious metals are placed in an entirely sepa ate room. Critical work for the electronics industry is processe under rigorous control and the department is under the immedi supervision of the plant chemist. The silver tank equipped w PR units is shown herewith. Heavy deposits of 24K gold for ra equipment are regular production items in this room.



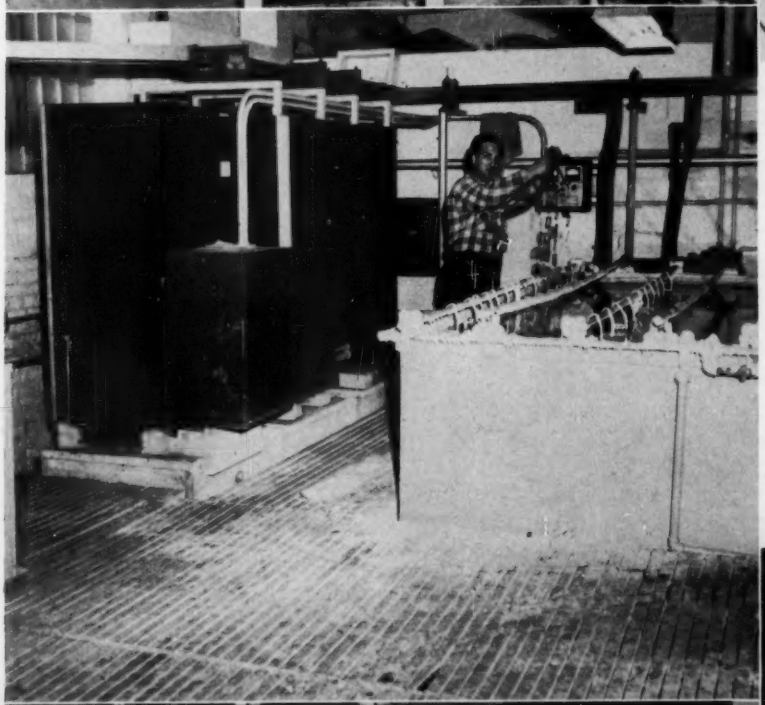


Figure 5. Left, Top: An example of the compartmentization an compactness of operation is the bright nickel line for small par as shown. The piece parts after racking are electrocleaned, acid dipped, copper, bright nickel and chromium plated. Separate de partments similar to this exist for zinc, cadmium, gold, silver, whit brass, hard chromium, anodizing, magnesium treatment, and blac oxide finish.

Figure 6. Left, Center: Large runs of tubular furniture are proc essed through white brass solutions. Illustration shows a han operated 1700 gallon tank. The DC power for this tank is provide by a 2500 ampere rectifier equipped with constant voltag regulation.

Figure 7. Left, Bottom: The other white brass solution is con tained in a 3000 gallon semi-automatic plating machine. The solu tion is cooled by refrigeration and maintained at 55°F. A agitation is used and is furnished by a turbine type blower. Th DC power for this solution is 5000 amperes.

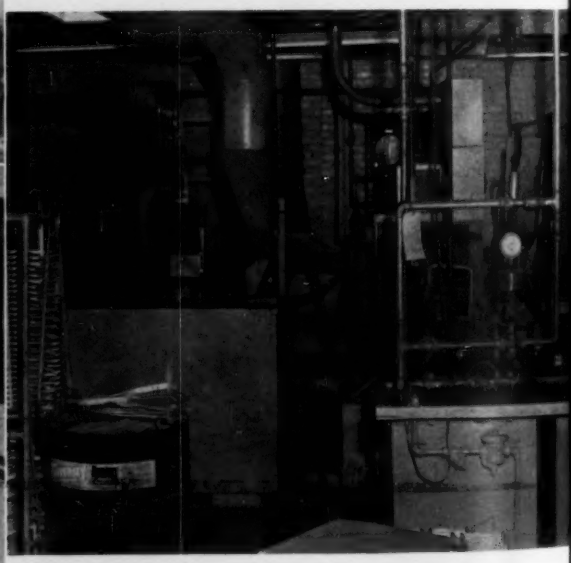
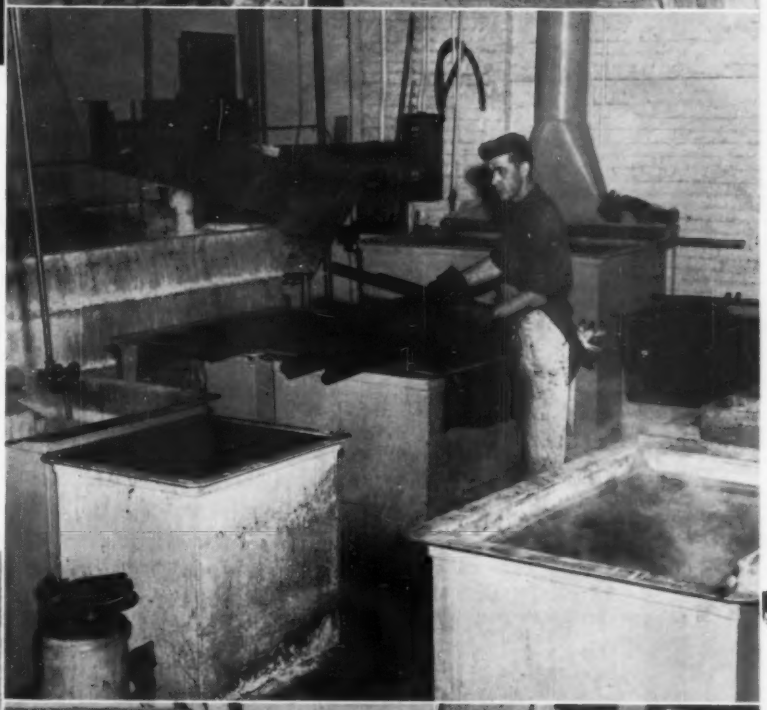


Figure 8. Above: The anodizing department contains bot chromic acid and sulfuric acid solutions. The chromic acid solutio is maintained at a temperature of 95°F. ± 5° by an automat regulator. Power is provided by a generator with automatic pr gressive voltage build-up, controlled by the panel board to bui up to 40 volts over a present time period. The control board has recording instrument for time and voltage for each load processe The sulfuric acid solution is cooled by refrigeration and maintain at 72°F. ± 2°. Power is supplied by a rectifier to give 1 to volts as required by the particular job.

Figure 9. Below: All racks used in the plant are fabricated in the maintenance department. Picture shows the plastisol coating tank and the curing oven.



Figures 10, 11 and 12. Additional plating and processing facilities are shown at right. Top: cadmium plating; Center: black oxide finishing; Bottom: small parts surfacing by burnishing and abrasive finishing. The exceptionally clean operating conditions are evident in these photos.

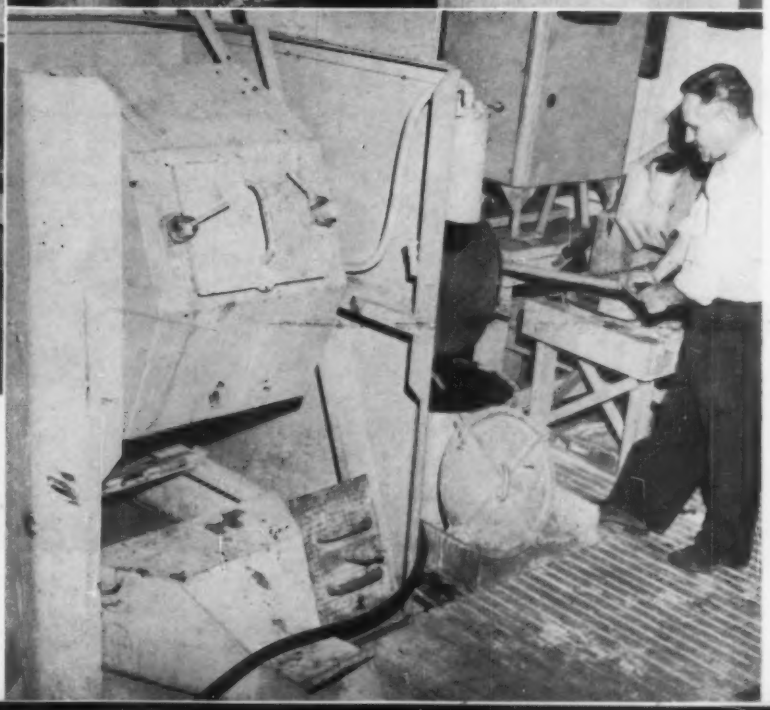


Figure 13. Above: Control and testing of all processing solutions and finished parts are carried out in a well-equipped laboratory. Solution analysis is performed on a regular schedule and Hull Cell test panels are run several times a day on bright solutions to insure maximum performance. For checking the thickness of deposit, the drop test, Magne-Gage and Kocour Electronic thickness testers are used. For determining the thickness of anodized films, the voltage break-down test is used. In addition to the company's own laboratory facilities, they employ the services of an independent laboratory to double check their own tests and perform corrosion tests as required by civilian customers and the armed forces.

Chromium Diffusion for Corrosion and Abrasion Resistance

Thermo-Chemical Process Makes Iron and Steel Heat, Corrosion and Wear Resistant

By Fred M. Burt

SUPERIOR heat, corrosion and wear resistance is now provided on ordinary low-alloy steels by a relatively new chromium diffusion process, recently made available by *Diffusion Alloys Corp.* of New York City. *Chromizing Company of California*, Los Angeles, headed by *Maurice Commanday*, president, has exclusive rights for the use of this process in California and *Chromalloy Corp.* of New York is licensee for the East.

As protective coatings against high-temperature scaling and various kinds of aqueous corrosion, chromized surfaces have several characteristic advantages. They are usually thicker than chromium electrodeposits, are non-porous, can be evenly applied to complicated shapes, and are so intimately associated with the base metal that they can be rolled or drawn with it. Alternatively, chromized surface layers, when produced on medium or high carbon steels, give the property of extreme surface hardness coupled with some degree of corrosion resistance.

The surface alloy that forms on the parts falls within the category of high-chromium steels, yet it is not a substitute for stainless, nor is it a replacement for chromium plating. Its field of application is between those of stainless and plating, and slightly overlaps in each case.

The desirable features are derived from an exchange of atoms between a chromium bearing powder and the steel or iron. Chromium, thus diffused into the base metal, becomes an integral part of it and, therefore, cannot peel, as is sometimes experienced with chromium plating. Not only does the chromium penetrate, it also displaces an equivalent amount of the ferrous base material, thereby leaving the dimensions of a part unchanged. This feature permits application of the processes to precision and intricate parts, as well as to threaded sections and fasteners, such as bolts and nuts.

The chromized layer, or "case", formed by the process, is greatly affected by the composition of the material being treated, and the selection of the material must be made with utmost care so that the desired end result be obtained.

With low carbon steels (up to approximately 0.25% C) a ductile, rather thick diffusion coating is produced. This coating has a "wet corrosion-resistance" roughly equivalent to 18-8 stainless steel and a somewhat higher oxidation resistance than 18-8, being usable up to approximately 1700°F. in air for extended periods without scaling. In addition, the low-carbon chromized coating is completely resistant to carburizing influences so that chromized low-carbon steel is almost completely inert in molten cyanide salts or carburizing atmospheres.

The process does not materially affect the dimension of

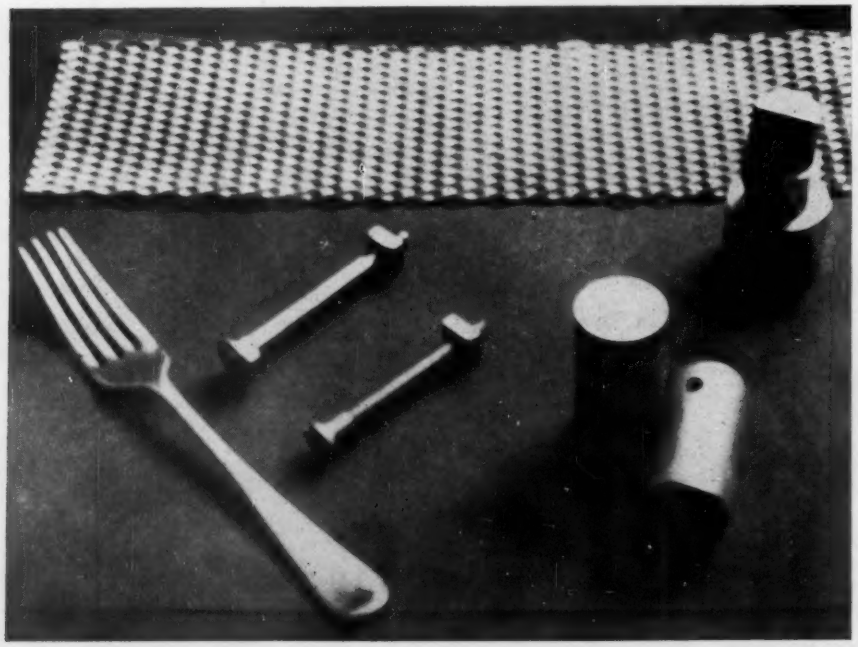


Figure 1. Typical, small chromized items: above is stove radiant made from low carbon expanded metal. At left is a steel fork polished to a finish comparable to chrome plating. In center, nut and bolt assemblies. Upper right, agricultural machine locking screw. Lower right, automobile engine cam followers.

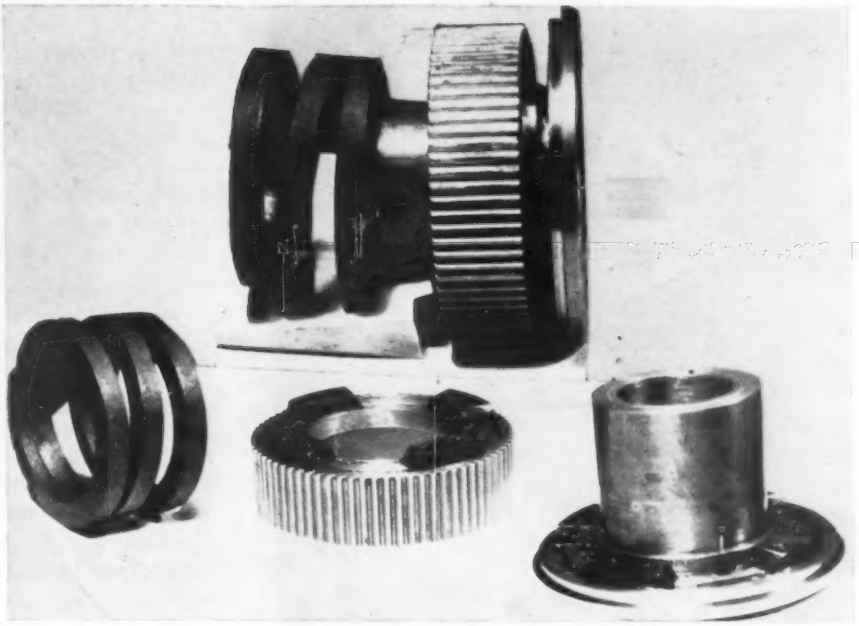


Figure 2. Torque limiting clutch — exploded above. Below are the two clutch faces and heavy spring fully disassembled. Carburized low carbon steels involved, with chrome diffusions, have excellent impact resistance.

parts being treated so that, for example, a nut and bolt can be coated and re-assembled afterwards without difficulty. It does not apply a coating, nor does it plate or deposit a film on the ferrous metal surface. Instead, it transforms the steel surface into: (1) high chromium stainless steel or (2) chromium carbide embedded in a high chromium alloy matrix. Which one of these products is produced exclusively, or predominantly, depends mainly on the composition of the steel being processed and the treatment selected. The depth of the case can also be varied over wide limits; it is limited by economical considerations and by the possible effects of prolonged heating on the characteristics of the core.

The Chromizing Process

The procedure is a fairly simple one. The part to be treated is first degreased. Chemically clean surfaces, required for electroplating, are not required in chromizing. Oxide films and, under some conditions, even heavy scale, are reduced to the metallic state in the initial stages of the cycle. In cases where parts are to be cold worked after processing, case ductility is increased by providing a clean surface prior to chromizing.

After cleaning, the parts are packed in a steel box, with a chromizing compound in the form of fine, compactible powder. As packing progresses, the powder is agitated by sharp vibration, causing it to flow into interstices and be compacted in such a manner as to eliminate as much air as possible and to provide a solid support medium. This eliminates any tendency for parts to distort through sagging under their own weight at high temperatures and to restrict distortion that may come about as a result of the release of internal stresses.

The steel box is then sealed with a special sealing technique which allows excess gases to escape but prevents ingress of air during the cooling part of the cycle. After sealing, the box is introduced into an ordinary heat treating furnace and brought to the required temperature. Temperatures involved are lower than previous techniques and run from 1500°F to 2000°F. for periods of from six to twelve hours, depending upon materials chromized and the affect to be achieved.

After the heating cycle, the box is removed for cooling, then opened, and the parts removed. The chromizing powder is quite friable and the parts are easily separated from it. Parts removed from the pack after processing are in bright, unoxidized condition. The surface generally has an appearance similar to vapor-blasted steel.

For heat resistance on low carbon steels, chromium concentration should be high, with penetration low, for temperatures to about 1650°F. Some formed parts, such as engine mufflers, should be chromized at 1700°F. while flat, resulting in a coating 0.001″ to 0.002″ thick, which is highly ductile.

This chromized low-carbon steel sheet material can be cold worked by bending, rolling, spinning, or drawing without causing the chromized case to crack and so expose the core to corrosion. This is understandable in view of the fact that the diffusion coating is, in effect, a modification of the existant structure of the material through actual alloying, and there is no adhesion problem. In fact, the case cannot be removed by any ordinary mechanical means. By treating parts at temperatures from 1800 to 1850°F. for lengthy periods, a coating from 0.002″ to 0.004″ can be built up. Although this coating is less ductile than a thinner one, the sheets can still be formed.

To provide resistance to wet corrosion on mild steel, the thickness of the metal and the carbon content of the steels are determining factors, with treatment temperatures varying between 1700° and 1980°F. and coating thicknesses from 0.001″ to 0.005″.

In order to obtain extraordinarily high resistance to corrosion, straight chrome steels are used, with the treatment limits previously outlined. This provides a very high chromium concentration at the surface of the metal.

The structural porosity in ferrous castings causes some loss in corrosion resistance added by chromizing. However, this can be largely overcome through use of extended periods of heating and chrome diffusion.

Since parts may be tightly packed in the chromizing box within 0.010″ of one another, the most economical method for producing sheet metal parts is to process flat blanks, which may then be cold-formed. Thus, a maximum utilization can be made of the space in the

Figure 3. Group of automobile cam followers shown in chromizing steel box surrounded by chromizing powder compound prior to removal, after diffusion treatment.

box. Since the cycle anneals the core material, cold worked strength may be imparted to the product by these subsequent cold working operations.

Coated low-carbon steel parts can be welded by any conventional method using filler material, provided that the filler rod is stabilized stainless steel. This type of weld is quite easily made and no loss of corrosion resistance occurs at any point.

The chromized layer can be polished by any method. Polishing produces a high luster not unlike chromium plating, but lacking the porosity of chromium deposits. However, chromizing is not ordinarily recommended as a decorative coating because of the increased cost over electrolytic surface finishes.

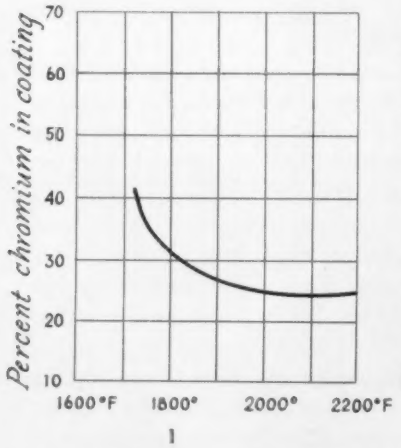
Applications

Some successful applications of the low-carbon corrosion-resistant type of chromizing include radiant grids for stove broilers, parts for washing machines, photographic processing machines, agricultural machinery, oil burners, internal combustion engine exhaust systems, cyanide fixtures and truck mufflers. Size presents no serious limitations; heavy ship anchor chains, as well as watch parts, have been treated successfully.

When the carbon content of the material being processed is higher than 0.25%, there is formed in the chromized case a substantial quantity of chromium carbide, the amount formed being a function of the carbon content and alloying elements in the material. Chromium carbide approaches the hardness of tungsten carbide and, in addition, has a very low coefficient of friction. The result is an extremely hard, abrasion resistance surface that has demonstrated remarkable impact resistance, despite hardnesses of $R_c 75$ and higher.

The diffusion of chromium in high carbon materials is impeded by the presence of the carbon so that this type of coating is usually between .0005″ and .002″ in thickness. It is often difficult for most of us to concede that any coating of that thickness can provide as much wear resistance as has been found in practice. However, the thickness of ordinary hard chromium plating is usually of the same order of magnitude and, though not nearly as hard or adherent as the chromized case, has been used successfully for years.

There is no problem of throwing power in chromizing and coating depths are very even. There is no tendency to build up on corners or hole edges and the holes themselves, unless masked or plugged, are chromized to the same depth as the surface material. The chromized layer faithfully reproduces the most minute surface contours and will generally follow the surfaces of extremely small pores existing in the material prior



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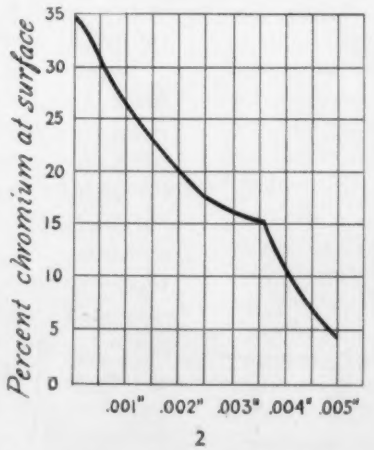

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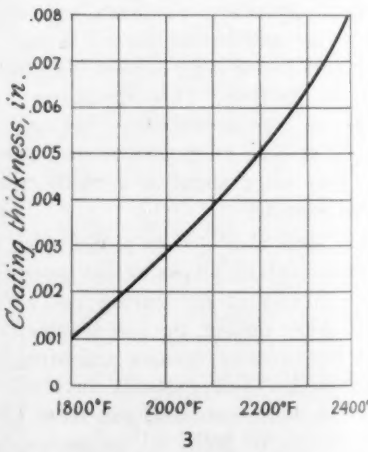

3

1. Average chromium content of coating formed on low carbon steels runs from 24 to 26% if chromized above 1900°F. but the content increases rapidly with temperatures below 1850°F. as shown above.

2. This curve of chromium concentration shows the decrease inwards from the surface. Starting with 35% at the surface, the concentration follows the descending gradient to about 15% at the boundary between core and coating.

3. This coating thickness curve was developed by setting the chromizing process temperatures at successively higher temperatures during a 4½ hr. heat. As the average chromium content of the coating and concentrations at surface and inner boundary are nearly constants, curves obtained by plotting thickness against time, and total chromium uptake against time, are approximately identical.

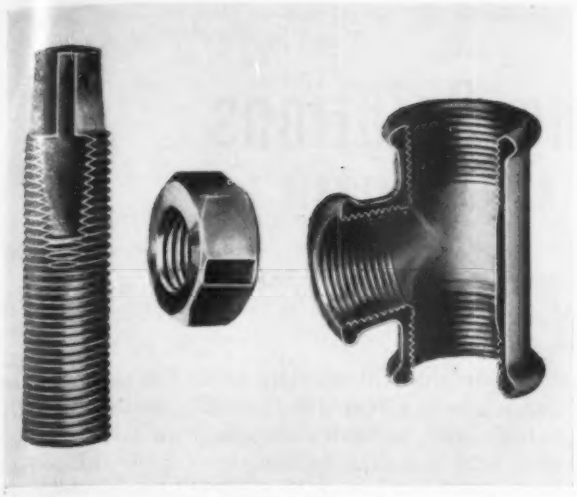

Figure 4. Above, left, chromized low carbon steel stud and nut, sectioned and etched with nitric acid to show diffused case (or coating). At right, is chromized malleablized cast iron pipe fitting sectioned and etched to show diffused coating.

to chromizing, even when the openings of these pores are very small.

On most wear-resistant applications, it is desirable to harden the core material after chromizing so as to provide support for the hard, thin, chromized layer. This presents no difficulty, however, as the hardness of the layer is apparently unaffected by subsequent hardening processes and remains essentially the same, despite quenching and tempering operations. It is desirable, however, to avoid some types of heat treating salts, as they tend to attack the treated surface.

In general, it may be said that the heat treating of chromized parts for abrasion resistance is not as critical as it would be for unchromized articles in the same application, since extreme core hardnesses are not required. For example, a high carbon, high chrome tool subjected to abrasion might be hardened and drawn with R_c65 plus as an objective. However, the same tool would resist abrasion far better, have greater impact resistance, and be far more consistent if the tool were first chromized, then hardened to R_c60-62.

High carbon chromium diffusions have shown excellent impact resistance, despite their great hardness. Unlike nitriding, there does not appear to be a tendency for grain boundary precipitation with accompanying brittleness. An example of this type of application is The Conveyor Company's Torque Limiting Clutch Cam shown in Fig. II. These cams, essentially functioning as clutch dogs, as well as throw-out cams, are made of SAE 1020 steel, carburized, chromized and case hardened to provide a wear resistant layer on a hard case over a tough core.

Mounted on the two clutch faces, they are held in mesh by the heavy spring which, in service, is compressed to 400 lbs. The test clutch, used to determine the impact resistance of the chromized cams, was arranged to be driven at continuous slip at 400 rpm, and operated for about one hour. After this period of time, during which the cams received about 100,000 impacts, the clutch was disassembled and the cams were found in the condition shown.

There was no spalling, chipping or mushrooming, the only apparent indication of wear being a bright, highly polished, slippery area at the contact point of the cam face. It is believed that, even after this extended test period, equivalent to three years of normal use, there is still considerable life in the parts.

Particularly impressive are the results of tests made in France in the tapping of phenolic sheeting. It was shown that a chromized high carbon steel tap will consistently outwear a high speed steel tap many times in this highly abrasive material. Where cutting tools are concerned, chromizing can be used where sharpening can be accomplished by grinding on one edge only, so that the grinding always leaves a chromized edge.

Although the low carbon treated steels have better corrosion resistance, the high carbon chromized steels are also corrosion resistant in the ordinary sense. Chromized tools, for example, never rust and otherwise exhibit a corrosion resistance similar to electroplated finishes.

Following is some background on the development of this chromium diffusion process. The idea of diffusing chromium into steel is not entirely new. First attempts at diffusing chromium into iron or steel were based upon simple contact cementation of chromium powder on the surface of iron at elevated temperature. In 1918, General Electric metallurgist, F. C. Kelley, carried out the first systematic investigation of chromium diffusion, but it was primarily a laboratory effort. Since then, others have developed more satisfactory methods.

During World War II, considerable technical progress was achieved in Germany, Great Britain and Russia. It is known that the Russians are now using a chromizing technique derived, in part, from wartime German processes. This Russian technique is apparently not quite as advanced as ours, but they have provided valuable research work towards the use of the

(*Concluded on page* 84)

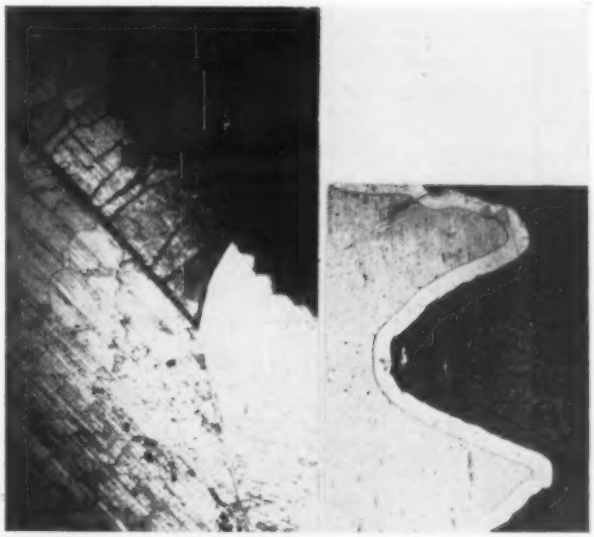

Figure 5. At right, micro section of chromized low carbon steel threads etched with nitric acid. At left is a welded, chromized low carbon steel part showing core at lower left; above it is the boundary separating it from the chromized case showing the latter's columnar structure; and at right is 18-8 filler weld material.

Control of Phosphating Solutions

ION EXCHANGER A NEW METHOD FOR RAPID ANALYSIS

By Gunnar Gabrielson, *Kemiska Fabriken Dr Ernst Harbeck A.B., Partille, Sweden*

Introduction

AS is well known, phosphating solutions contain phosphates of the heavy metals, usually zinc or manganese phosphates, in addition to an excess of phosphoric acid. In order to accelerate the coating process some agents, called accelerators, are added; these accelerators are usually nitrate (added as nitric acid or sodium nitrate) and chlorate (added as sodium chlorate). In rare cases nitrates and chlorates are used together. In order to further increase the phosphating rate, small amounts of some other agents are added, e.g. sodium nitrite in nitrate accelerated solutions. The amounts of these agents are, however, very low.

In the analysis of phosphating baths only the percentage of phosphate and accelerators are determined in most cases, and not the metallic ions. The percentage of phosphate is determined by precipitating and weighing as ammonium phosphomolybdate or sometimes by dissolving the ammonium phosphomolybdate precipitate in an excess of sodium hydroxide and titrating the excess hydroxide with standard acid.[1] The sum of nitrate and nitrite is determined through reduction with Devarda's alloy, collecting the ammonia formed in sulfuric acid and titrating the excess acid with sodium hydroxide.[2] The amount is given in per cent nitrate, as the amount of nitrite is so low that it can be disregarded in comparison with nitrate. The amount of chlorate is determined through reduction to chloride and titration according to Mohr.[3]

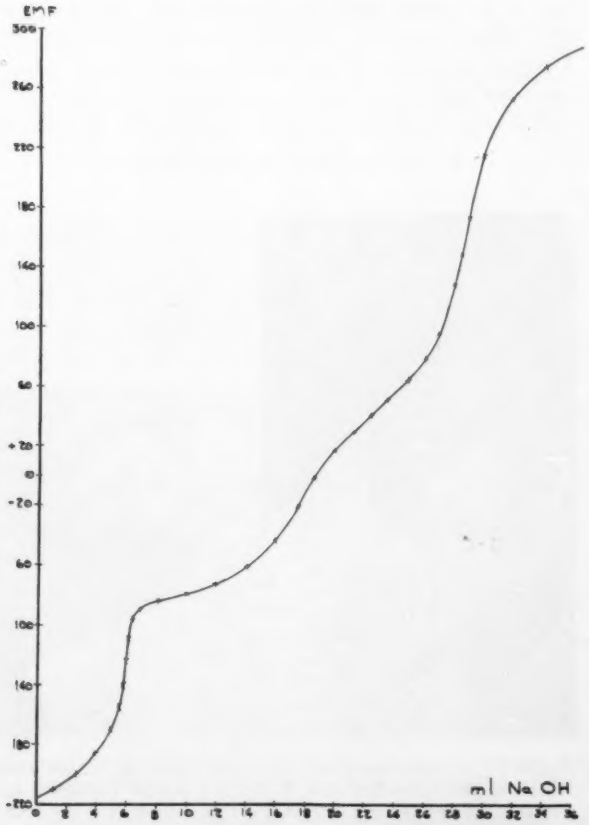

Figure 1. Potentiometric titration of a phosphating solution.

As is seen from the account given above, the methods used in the analysis of phosphating solutions are rather time-consuming. The analysis can be made considerably faster with the aid of a cation exchanger in the hydrogen form. During passage through the ion exchange bed, the cations of the phosphating solution are exchanged for hydrogen ions. The eluate, containing only acids, can be analyzed through titration against methyl orange and phenolphthalein. This method has been used by Helrich and Rieman[4] in the determination of P_2O_5 in apatite.

Apparatus

The cation exchanger used was Amberlite IR-120, which is of the sulfonic acid type. The particle size was 0.20-0.49 mm. in air dry condition. The ion exchange columns were of ordinary type as described, among others, by Djurfeldt and Samuelson.[5]. The height and diameter of the resin layer were 150 mm. and 9.8 mm. respectively in all experiments described in this paper. The ion exchanger was transformed into the hydrogen form by passing 150 ml. 3 N hydrochloric acid through the column and subsequently washing with water (about 150 ml.) until neutral reaction of the filtrate was obtained. The flow-rate was about 2 ml. per min. during regenerating and washing.

Analysis of Known Solutions

Concentrated phosphate solutions (from which phosphating baths are prepared through dilution with water), the compositions of which were taken from patents,[6] were prepared from very pure zinc oxide, manganese carbonate, phosphoric acid, nitric acid, sodium nitrate, and sodium chlorate. 3-4 ml. of the concentrated solutions were carefully weighed and diluted with distilled water to 100 ml. 10 ml. of the dilute solution were passed through the ion exchange column; afterwards the resin layer was washed with about 50 ml. distilled water, flow-rate being about 2 ml./min. The filtrate and wash water were collected in a beaker and titrated with 0.1 N sodium hydroxide, first against methyl orange and after that against phenolphthalein. Supposing the titration against methyl orange to re-

quire "A" ml. and total volume to the phenolphthalein end point to be "B" ml., we then have:

$$\text{Grams of phosphoric acid in the sample} = \frac{(b\text{-}a) \times 0.1 \times 98.04}{1000};$$

Where 98.04 = the equivalent weight of phosphoric acid.

$$\text{Grams of accelerator in the sample} = \frac{a - (b\text{-}a) \times 0.1 \times E}{1000} = \frac{(2\,a\text{-}b) \times 0.1 \times E}{1000}$$

Where E = equivalent weight of the accelerator.

The results of the experiments with known solutions are presented in Table I in which are given the compositions of the concentrates and the values estimated from the ion exchange analysis.

As seen from the table very accurate results have been obtained with the proposed method. The deviations are generally less than 2 per cent, which are at least as accurate as the results obtained through the methods hitherto used.

Analysis of Commercial Phosphating Solutions

The ion exchange method, described above, has been used for analysis of concentrated phosphate solutions produced from industrial chemicals. These compositions were also taken from patents.[6] As a comparison, the phosphates and accelerators have also been analyzed by the usual methods. The results, which are presented in Table II show that the values obtained by the different methods agree very well, the advantages

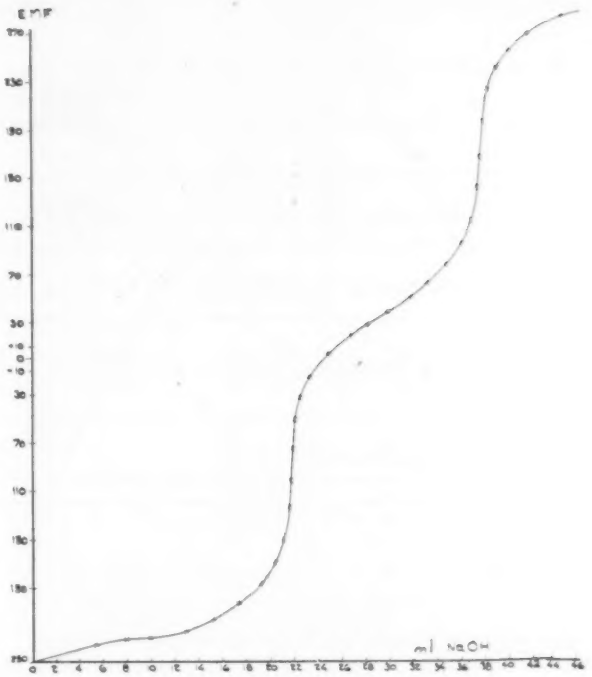

Figure 2. Potentiometric titration of a phosphating solution, passed through a layer of a cation exchanger.

of the ion exchange method being that it is much more rapid and is simpler to perform.

In the analysis of phosphating solutions, the "free acid" is determined by titration to the methyl orange endpoint and the so-called "total acid" by titration against phenolphthalein. It would appear possible to determine the amount of phosphates directly from the difference between the two titrations. This is, however, impossible because zinc and manganese hydroxides respectively are precipitated before the neutralization against phenolphthalein occurs; because of this it is,

TABLE I

No.	Type of Solution	Composition of solution in per cent H_3PO_4	NO_3	ClO_3	Composition of solution in per cent, found by the ion exchange method H_3PO_4	NO_3	ClO_3
1	Manganese phosphate	30.52	1.69	—	30.84	1.72	—
2	Zinc phosphate	25.32	26.21	—	{25.25 {24.93	{26.18 {25.94	—
3	Zinc phosphate	23.73	15.82	—	{23.53 {23.89	{15.95 {15.89	—
4	Zinc phosphate	19.41	—	6.24	{19.74 {19.17	—	{6.39 {6.12

The accelerators used were: Solution No. 1: HNO_3
" " 2: $HNO_3 + NaNO_3$
" " 3: HNO_3
" " 4: $NaClO_3$

TABLE II

No.	Type of Solution	Composition of solution in per cent, found by ion exchange method H_3PO_4	NO_3	ClO_3	Composition of solution in per cent, found by usual methods H_3PO_4	NO_3	ClO_3
1	Manganese phosphate	33.1	—	—	33.5	—	—
2	Manganese phosphate	30.6	12.25	—	30.5	12.35	—
3	Zinc phosphate	{35.8 {36.1	8.91	—	36.2	8.76	—
4	Zinc phosphate		—	14.83	21.1	—	14.96

The accelerators used were: Solution No. 2: HNO_3
" " 3: $NaNO_3$
" " 4: $NaClO_3$

The analytical methods used were: for phosphates—precipitation as ammonium phosphomolybdate[1]; for nitrates—reduction with Devarda's alloy[2]; for chlorate—reduction to chloride and titration according to Mohr.[3]

of course, impossible to determine the percentage of phosphates from the titration values. This is evident from potentiometric titrations of samples of a phosphate solution, one sample being passed through the ion exchange layer. The results are presented in Figures 1 and 2 which show the electromotive force (E.M.F.) as functions of the sodium hydroxide consumed. Figure 1 refers to the titration of a solution which has not passed through the ion exchanger and Figure 2 to the titration of a solution after the ion exchange passage. Figure 1 shows clearly the first neutralization point whereas the second neutralization point is not seen at all. In Figure 2, however, both neutralization points are seen clearly.

Discussion

As seen from the above, the ion exchange method described in this paper is comparatively rapid and sufficiently accurate for the determination of phosphates and accelerators in phosphating solutions. However, it must be pointed out that, whereas the per cent of phosphates can always be found by this method, the amount of accelerators in some rare cases cannot be determined directly, namely when more than one accelerator is used, e.g. nitrate and chlorate. In this case the sum of accelerators is obtained, after which one of them must be determined separately and the other estimated from the difference. The ion exchange method, however, is also much more convenient and rapid in this case than other methods, as the amount of phosphate is determined at the same time when titrating the solution. The total time for the analysis is, therefore, considerably shortened in comparison with other methods.

It must also be pointed out that contaminants in the phosphating baths, e.g. acids and salts, usually are titrated with the accelerators against methyl orange and, therefore, the per cent of accelerators obtained is too high. However, the amounts of contaminants are usually low in comparison with the high per cent of accelerators and may be disregarded in this connection.

The method of analysis described here is, of course, not restricted to analysis of phosphating solutions but can be used for determination of phosphates in general.

Summary

1. A method has been developed for determination of phosphates and accelerators in phosphating solution concentrates and in phosphating baths.

2. The analysis is performed in the following manner: For concentrates: 3-4 ml. are weighed accurately and diluted to 100 ml. with distilled water.

For phosphating baths: A sample of the bath is diluted with an equal volume of distilled water.

10 ml. of either of the above diluted solutions are passed through a layer of a sulfonic cation exchanger in the hydrogen form (height and diameter of the resin layer are 150 mm. and 9.8 mm. respectively); afterwards the resin layer is washed with about 50 ml. distilled water. Flow rate is about 2 ml. per min. The eluate is titrated with 0.1 N sodium hydroxide first to the methyl orange endpoint and then against phenolphthalein. From the results of these titrations the amounts of phosphates and accelerators can be determined, as described in this paper.

3. The method outlined here is very accurate, the maximum relative error being *less than* 2 per cent, and is much faster and simpler than methods hitherto used in analysis of phosphating solutions.

References

1. Scott, W. W., Standard Methods of Chemical Analysis, Fifth edition, New York, pp. 694, 697 (1939).
2. Loc. cit., p. 640.
3. Loc. cit., p. 274.
4. Helrich, K. and Rieman, W., *Ind. Eng. Chem.*, Anal. Ed., **19**, 651 (1947).
5. Djurfeldt, R. and Samuelson, O., *Acta Chem. Scand.*, 4, 165 (1950).
6. B.I.O.S. Final Report No. 257.

Triangular Logarithmic Net for the Calculation of Plating Thicknesses

By D. R. Curry, B.Sc., A.R.I.C., *Bragg Laboratory, Naval Ordnance Inspection Department, Sheffield*

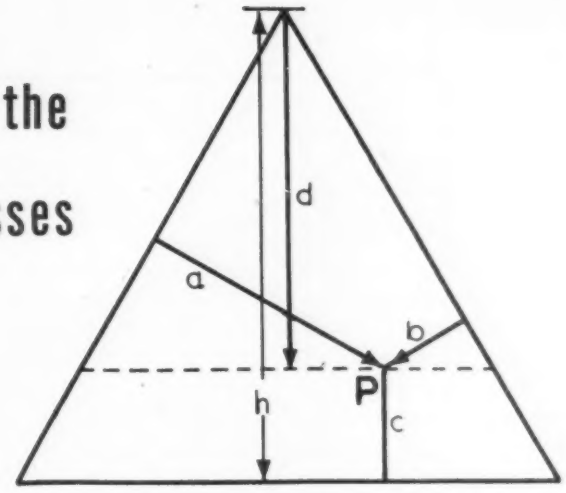

Fig. 1. Demonstrating the Mathematical Theory.

THE usual methods for determination of plating thickness, such as the B.N.F. jet tests,[1] are somewhat empirical and are of little use upon articles devoid of flat surfaces, or for small objects such as nuts, bolts and springs. Thus, it is usual to evaluate the total quantity of plate metal either by solution and subsequent chemical determination, or from the difference in weight of the sample before and after stripping with a solution which dissolves the plate metal without attacking its base. In either case, the resultant answer is a *weight* of metal plate.

Since specification requirements for plating are expressed in terms of thickness (usually in thousandths of an inch), the weight of plate (in grams) must be converted to a thickness by calculating from the density and the area of the surface plated. If a large number of similar objects are being examined it is a simple matter to evaluate a conversion factor and prepare a table or graph of relative value. When, however, a hundred or so determinations are made in an afternoon of different metal coatings on samples of various sizes, the necessary calculations are tedious and time consuming. The use of a slide-rule has the disadvantage that the all-important position of the decimal point is not given directly. The device to be described is an attempt to answer the need for a rapid method of calculation.

Mathematical Theory

In an equilateral triangle the lengths of perpendiculars dropped from a point P to the three sides a, b, c are such that:

$$a + b + c = h \qquad \text{.....(1)}$$

where h is the height of the triangle for any position of P (see Fig. 1).

This elementary geometric principle is used in the application of triangular graph paper to the representation of ternary systems.

From (1) it is seen that:

$$\therefore \quad a + b = h - c$$
$$a + b = d \quad \text{(see Fig. 1)} \qquad \text{.....(2)}$$

It should be noted that a and b are measured from the base lines and d is measured from the apex.

Thus if:

$$a = \log A$$
$$b = \log B$$
$$d = \log D$$

the co-ordinates (a, b, d) of any point P, which is specified by any two of the co-ordinates, are such that d is the log of the product A and B,

$$\text{i.e. } AB = D \qquad \text{.....(3)}$$

Furthermore, on a rectilinear graph, if

$$x = \log X$$
$$y = \log Y$$

any relation of the form:

$$Y = KX \qquad \text{.....(4)}$$

will be a linear graph of unit slope, the intercept being log K.

Application

The volume of plate (V) is given by the product of area (A) and thickness (t): this expression $At = V$ is of the form of equation (3) which it has been shown may be represented by a triangular diagram. If the scales a, b and d are logarithmic and are for area, thickness and volume respectively, the triangle represents all possible solutions to the equation $At = V$ within the range of the scales. The values of A, t and V are then read directly.

Log V (the d co-ordinate) may then be combined

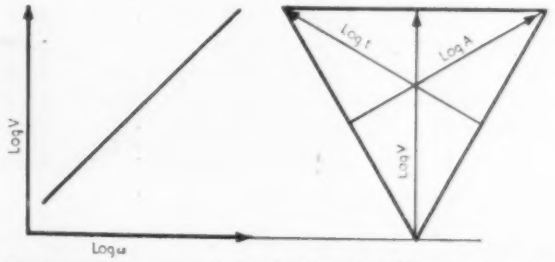

Fig. 2. Demonstrating the Application of the Theory to Practice.

Reprinted from Electroplating.

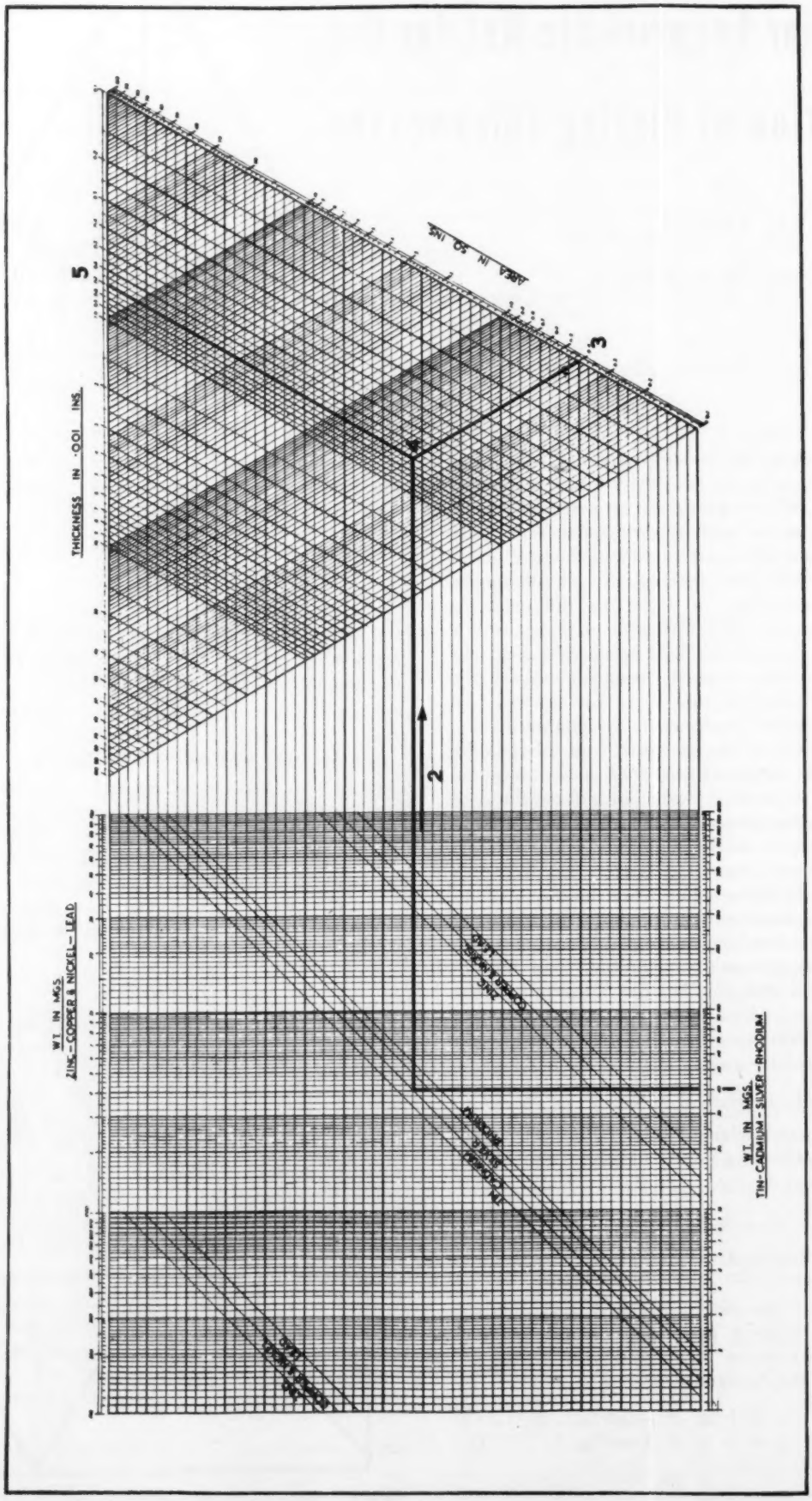

Fig. 3. Reproduction in Miniature of a Working Diagram. The Bold Lines show the Solution of an Actual Problem.

with a rectilinear graph as the y co-ordinate, x being log w where w is the weight of plate. The value of K in equation (4) is the reciprocal of the density of the metal in terms of the units involved, i.e. grams, sq. inches, and thousandths of an inch.

The combination may conveniently be performed by placing the two diagrams side by side (see Fig. 2).

Practical Form

The basis of the scheme is thus to read the weight of plate on the x axis of the left-hand graph, and from the line drawn for the metal concerned to obtain the value of log V. The area of the object is known and thus from these two co-ordinates a point is defined in the triangle and the third co-ordinate (t) may be read off directly.

If the two parts of the diagram are drawn to the same logarithmic scale, there is no need for the absolute value of V to be determined. It was, therefore, decided that the vertical scale of correspondence between the two parts might be linear as this would simplify the triangular net and also facilitate reading and transfer from the graph to the net.

It had then to be decided what ranges the scales should cover: they are inter-dependent and must each have the same number of logarithmic steps (0.1-1.0, 1.0-10.0 etc.). After consideration of the most frequent values used it was decided to construct thousandfold scales each fifteen inches long (i.e., the scales are those at the top of a normal 10 inch slide-rule.) The ranges were as follows:

Weight, in milligrams : 1-1,000
Area, in square inches : 0.1-100
Thickness, in 0.001 inch : 0.1-100

As far as sub-divisions of the scale were concerned, the practical point of restricting the number of lines to reduce confusion at the center of the triangle had to be reconciled with the sub-divisions required to give sufficient accuracy of reading.

The final result is shown in Fig. 3. In the original, the thickness and area scales are drawn in red and green respectively to aid clarity and a series of lines have been drawn for the various metals considered. The lines for Zinc, Copper, Nickel and Lead are transposed otherwise their proximity to those for Tin, Cadmium and Silver would make reading difficult.

The procedure is illustrated by the example shown in Fig. 3, *viz.:*

Weight of Cadmium 40 mgs. on an area of 0.40 sq. in.

The weight is read on the x-scale (1) and taken up to the cadmium line to give a y-value which is transferred (2) to the triangular diagram. At the inter-section of this with the given area ordinate (3), the point (4) is specified. The thickness value may then be read off on the top scale (5) giving a value of 0.00070 in.

Accuracy and Advantages

When considering the accuracy of the method, it must be remembered that the normal determinations of plating thickness are not of a high order of reproductibility, due to variation from sample to sample in the same batch: the results do not merit the statement of a third figure in the final value of the thickness. Accordingly, the logarithmic scales, giving the same degree of accuracy in the high and low ranges, are suitable and may be read conveniently to two figures for weight and area—and in the lower parts of each logarithmic step to three figures. Indeed, it may be said that the logarithmic scales, demanded by the theory, are an advantage in condensing the required ranges into practical limits. The time saved in making a number of calculations, using the net, is about 50-60 per cent. of that taken to obtain the results by normal arithmetical methods.

Once the master copy has been prepared with the required metal lines drawn, it may be reproduced by any photographic process. If it was desired to make additions to the reproductions, a tedious tracing and 'true to scale' copy process would be necessary. Actual determinations use the net lines and depend on the relative positions of points to them. Any unevenness caused by paper shrinkage, etc., will not affect the results. The only disadvantage in any reproduction is that the facility with which the colored lines may be read is lost in a total black and white figure.

Other Applications

It will be seen that the basic idea may be applied to any problem of repeated determinations of one of the values of equation (3) when the other two variables are known, provided that the desired accuracy may be obtained from a logarithmic scale. In its simpler form (equation 2) it may be adapted for the solution of simultaneous equations or other expressions of the form $K_1a + K_2b = K_3c$. When the values of K_1, K_2, K_3 are complex it may be advantageous to construct a triangular net with the scales corrected accordingly.

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Reference

1. For these and other details of procedure see Protective Coatings for Metals, J. W. Gailer and E. J. Vaughan. Griffin, 1950, pp. 178 *et. seq.*

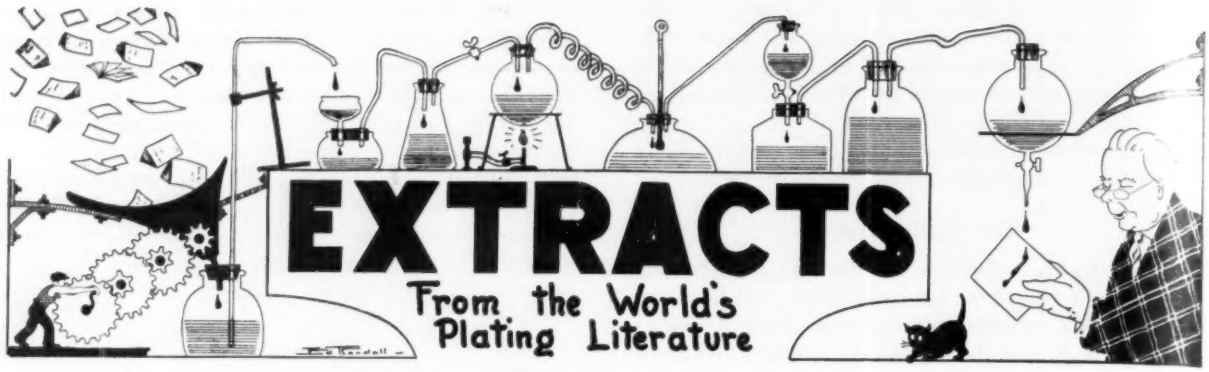
COMMENTS BY WOOD

(*Concluded from page* 68)

that the solution would no longer plate bright when the dispersion was filtered out (diatomaceous earth). Just as frequently I found evidence that bright plate was being produced in the absence of a solid dispersion. Therefore, I think it is safer to assume that anything can happen and probably does.

I also think there is a growing tendency to believe that all deposits which are not definitely columnar or acicular are influenced toward refinement and flatness by mechanisms similar to that hypothesized for bright silver. The micrograph on page 68 is carbon disulfide brightened silver deposited on rolled silver base and, at least, does not contradict any of the above.

Very truly yours,
Signed: Donald Wood
Hill Cross Co.,
21 New Chambers St.
New York 38, N. Y.



Diffusion Process with Chromium Plated Steel

E. Raub; *Mitt. d. f. Mitgl. d. Forsch. Blechverarbeitung*, No. 2, 1952, p. 13.

The technical application of the diffusion of electroplated chromium on steel has the object of the conversion of thin, non-stainless chromium coatings into thick, pore-free stainless chromium-iron alloy coatings which, in addition to providing corrosion protection, also impart a decorative effect. The application of the process is limited because of the high temperature of the chromium diffusion. To prevent oxidation, the diffusion must be conducted in a vacuum or a dry, inert atmosphere. Research is necessary as to whether chlorides can accelerate the diffusion and as to whether, by short-time heat treatment, the corrosion resistance of thin chromium coatings as regards pores and other faulty areas, can be improved without adversely affecting the decorative effect.

Cast Aluminum Alloys for Electropolished and Eloxal Processed Parts

M. Buckeley-Liesegang and A. Buckeley; *Metalloberflaeche*, vol. 6, No. 3, pp. A33-A41.

These parts are used extensively in large quantities for furniture, transport, refrigerator, sanitary ware, shop fittings, lighting equipment, etc. Regarding the influence of the usual alloying constituents, copper, zinc, silicon, magnesium, fundamentally these elements which improve the casting properties of the alloys, such as copper and particularly silicon, also influence the clearness of the Eloxal anodized coating. The requirement of the alloy for simultaneous good casting and Eloxal processing characteristics can accordingly only be fulfilled to a limited extent. The weathering resistance is reduced by practically all the heavy metals and the handling resistance in addition also by higher silicon contents. The castings must be sound as every defect clearly shows up on subsequent polishing or anodizing. The normal production defects encountered and their avoidance are as follows:

(a) "Ice Flower" appearance on anodizing — Overheating.

The "flowers" which show up after anodizing and may be considered as one of the most frequent defects encountered are due to a coarse-grained crystal structure of the metal. This coarse-grained structure is caused by overheating of the metal. Not merely the casting temperature but also the melting temperature is decisive for a uniform fine-grained structure, which will Eloxal without forming this "flower" surface appearance.

(b) Heat Cracks — Overheating, shape and thickness of part.

A coarse-grained structure also renders the metal sensitive to heat cracks. To avoid too high a casting temperature, thick and thin walled parts should not be cast simultaneously from the same melt. Edges should be rounded off, to avoid these locations hanging-up in the mold during cooling and causing cracking.

(c) Pores, streaks, gas bubbles, inclusions.

One cause of pore formation is in the mold sand. On subsequent polishing of the metal these pores can lead to the formation of streaks and "rats tails." Pores which are merely caused by a coarse grained molding sand show up on the casting. More dangerous are these pores underneath the casting skin, which are only noticeable on buffing and polishing. If these pores are located on the bottom section of the casting, this is generally due to the mold sand being too damp. Pores can also arise from gasified metal. Gas pores are primarily caused by overheated metal.

(d) Air holes. These are large pores caused by air inclusions.

(e) Matte or troubled anodized coating — alloy segregation.

Quite often this trouble can be traced back to the foundry and is due to bad handling of the foundry scrap. When several different alloys are being processed, the foundry scrap must be kept strictly separate and put into marked boxes. Al-Mg alloys lead to marked brittleness when they pass into copper or silicon containing alloys. Such admixture of copper and silicon-containing alloys to copper-free Eloxal alloys give defective anodized coatings. A silicon content of 1% becomes very noticeable in reducing the brilliancy of the Eloxal coating.

(f) Clouding and pitting with Eloxal anodizing.

To those casting faults which only become noticeable at the anodizing stage belongs what is termed "foam-

ing." a mixture of metal, oxide skins and air which always assembles on the surface of an aluminum bath on melting. It can also be formed during the casting process.

Alternative surface processing of aluminum can be practiced, such as clear lacquering or plating, but the satin smooth finish of an Eloxal treated surface is less harsh to the eye and blends better with non-metallic surroundings and an anodizing treatment provides the most durable surface treatment for aluminum.

Pickling, Buffing and Coloring of Aluminum and Alloys before Anodizing

R. Erdmann. *Metalloberflaeche*, vol. 6, No. 3, pp. B36-B42.

Aluminum is soluble in both acid and alkaline solutions, and so acid or alkaline pickles can be used; it is most usual to employ a pickle in caustic soda, generally a 10 to 20 per cent solution, at 50° to 80°C. The pickling time should not be too prolonged, only ½ to 2 minutes and, if necessary, preferably after rinsing and brushing, the metal can be given another short pickle. Leaving the aluminum too long in the pickle will lead to non-uniform attack of the surface. After pickling, the rinsing should be conducted in flowing water, and it is best to give a subsequent dip in dilute nitric acid (about 1:2) to neutralize the residual alkali, followed by another rinse. The nitric acid dip is particularly necessary with copper-containing alloys as with these a porous black coating remains after the caustic soda pickle.

Acid pickle baths are used mainly for high silicon-containing alloys and contain equal parts of concentrated nitric acid and saturated sodium fluoride solution or also 60% hydrofluoric acid. A dip is given for about 5 minutes in this bath at room temperature. Small additions of hydrofluoric acid are also made to the nitric acid as the second pickle for silicon-containing alloys after the pickle in caustic soda.

General rules for the choice of buffing wheels and materials (coarse and fine) for aluminum cannot be given; under given conditions the buffing effect will be all the less the more elastic the wheel in use. Loose discs are particularly suitable for irregularly shaped parts and because of their elasticity do not tend to burn so readily as an unelastic disc. For the polishing material, silicon carbide buffs sharpest, synthetic emery and particularly natural emery less sharp. Abrasives containing iron oxide should not be used for buffing aluminum intended for anodizing, as particles of foreign metals pressed into the soft aluminum surface and retained will lead to corrosion during the processing and, particularly with anodizing treatment, will give rise to spotting-out trouble, discoloration and bad film characteristics. Both for the buffing and also the polishing, no wheels should be used which have been used previously for surfacing other metals. Good results are generally obtained with silicon carbide glued on a soft disc buff or applied as a buffing paste; for fine buffing or pre-polishing also an oil medium buffing paste on a leather wheel or a sewed rag wheel. For subsequent coloring, particular attention must be paid to uniformity of grain of the buffing compound. Fine scratches caused by coarse particles, which are not visible even at the fine buffing stage, show up on coloring. For fine buffing the wheels are generally run at 30=40 meters/sec. which, with normal wheel diameters, is around 1,500 to 2,800 rpm.

The fine buffed parts must be cleaned before coloring with degreasing agents, petrol or tri- or perchlorethylene and dried in fine sawdust after which any dry dust must be carefully removed. Pickling the parts in a weak alkaline bath is recommended, which serves to remove any particles imbedded in the surface. Coloring is conducted first in an alternating direction and finally as unidirectional. Pre-polishing is conducted with a tripoli pre-polishing paste or often with pumice and oil. A good pre-polishing facilitates the final high polish. If a particularly white color is required, oil must be avoided.

Strong heating during the coloring must be avoided with parts intended for anodizing, as the composition will burn in and, when only an electrolytic degreasing is used, the oxide film will be matte and spotted. Excessively high wheel speed should be avoided. After coloring, the parts are washed with a degreasing solvent and soft rag in the polishing direction and dried with fine sawdust. For reflectors, before the last high polish, a light intermediate pickle is given with a weak alkali. If the aluminum is to be plated, the last high polish stage should not be given as bad adhesion of the plate will be obtained with too highly polished a surface.

Aluminum-magnesium and aluminum-magnesium-silicon alloys polish best. Copper-containing alloys will be found to be more difficult. Alloys which, in addition to copper-aluminum mixed crystals, contain metals of the iron group, nickel, cobalt, chromium, manganese, which form no mixed crystals, take a high polish and are corrosion resistant. The silicon-magnesium-manganese alloys are silver white in the polished condition; with increasing silicon content the polishing characteristics are reduced.

Porosity of Anodized Films

O. Kubaschewski and A. von Krusenstjern; *Metalloberflaeche*, vol. 6, No. 7, pp. A97-A102.

A criterion for the apparent protective effect of an oxide film on a metal surface is best obtained by means of the volume quotient. By this volume quotient is understood the ratio of the molecular volumes of the oxides (molecular weight density) to the atomic volume of the metal concerned. If this quotient is smaller than one, it signifies that the oxide film formed cannot cover the metal surface without pores and accordingly can provide no protective effect. If the volume quotient of an oxide is greater than two, then it signifies that the oxide film occupies considerably more space than is available from the base metal and, as it cannot completely accommodate itself to this condition, stressed oxide coatings result which easily flake away with a slight blow. Oxide coatings with volume quotients between one and two can be regarded in general as favorable from the viewpoint of the protective action. Other factors, however, also can play a deciding role in this connection. Metals with volume quotients of 1-2 in general have an oxide coating growth conforming to the fourth power of the time, and there is accordingly a

parabolic law. Examples by which these requirements are fulfilled are nickel and aluminum. Accordingly, so that the metal surface can be practically covered without pores by the oxide, the continuation of the reaction must be controlled by diffusion reactions. The oxygen is relatively voluminous and, as a result, the metal ions practically always undertake the material exchange. The metal ions migrate via faulty places in the oxide lattice and react at the external surface of the oxide coating with the oxygen. Because of the necessary electron neutrality, the equivalent number of electrons must accompany the wandering metal ions. Aluminum oxide coatings are known for their good protective action and, presumably, mainly on account of their volume quotient of 1.6. The total oxidation rate is determined by the rapidity of the diffusion of Al^{+3} ions. This holds good naturally only for the low temperature modification of aluminum oxide, alpha — Al_2O_3 and not for the high temperature modification.

As the size and number of the pores are of outstanding technical significance as regards the application and service behavior of anodized coatings and examination by means of the electron microscope is difficult, the present research covered investigations of existing pore test methods for anodized coatings as given in the literature. Modifications of these test methods were also examined and their applicability investigated. In applying these pore test methods a fundamental differentiation has to be made between the coarser macro-pores which can be seen with the naked eye or at a magnification of 30 and the micro-pores with an average diameter of 0.04 microns.

The following methods were examined: (1) Attack by chemical reagents, such as sublimate solution, copper sulfate solution, etc. on the base metal through the anodized coating was examined. (2) The increase in weight by impregnation of anodized coatings with lead nitrate, copper sulfate and potassium dichromate was determined. (3) Anodized coatings were examined at 1,000 magnification in section by reflected and transmitted light. (4) The relation was investigated between the anodizing duration, the increase in coating thickness and light reflection of the coatings. The following findings were obtained:

The attack of chemical reagents through the anodized coating to the base metal does not take place through all the pores but only through the relatively few macro-pores. These are located mainly at the edges and at points of surface unevenness. The macro-pores at the edges appear to be of greater diameter. If the macro-pores are sealed no attack was found after three days exposure. With dyeing or impregnation test methods, the effect extends over all the pores but intermediate drying must be avoided as, by this, the structure of the coating is changed in an imperceptible manner. Examination by transmitted light of coatings removed from the base metal showed regions with varying light transmission. On dyeing and a subsequent microscopic examination a greater dye absorption was seen in these areas. Obviously, greater pore formation occurs at certain areas of the coating. The light reflective capacity of the anodized coatings falls with increasing coating thickness. It was further established that the thickness growth leads to an optimum thickness value and then again falls by virtue of the back-dissolving effect of the electrolyte.

CHROMIUM DIFFUSION

(*Concluded from page* 75)

Becker-Daeves-Steinberg process, developed in Germany during the war.

Robert L. Samuel, an Englishman, educated in France, has developed the process now considered to be the most commercially practical and economical method of chromizing yet devised and the one which Chromizing Company of California is now using.

The effect of chromizing on a steel surface can best be compared to that of a penetrating stain on wood; the stain diffuses into the wood and wears only with the surface itself. On the other hand, using the same manner of comparison, chromium plating could be likened to an enamel finish on top of the wood surface which bears the entire brunt of wear without the reinforcing strength given to the stain diffusion.

Although previous chromizing methods have been complicated and rather costly, the present process is vastly simpler and less costly than those previously tried. It is difficult to present an average cost, but the process is comparable in price with many present day heat-treating processes.

Frequently, chromizing may replace hard chromium plating for abrasion resistance, and may sometimes substitute for stainless steel; however, it is not anticipated that the process will displace either this process or material but rather, have its own field of application.

Summarizing, chromizing treatment of steel or iron parts can:

1. Render the surface of low-carbon steel oxidation-resistant.
2. Surface harden and rustproof the surface of plain carbon steel in one operation.
3. Create a corrosion resistant case on many types of steel including iron powder sinterings.
4. Improve the oxidation, corrosion and erosion resistance of chrome and other stainless steels.
5. Make the surface of cast iron and tool steels more wear resistant than any heat treatment.
6. Reduce material cost by avoiding the need for highly alloyed steels.
7. Save fabricating costs by the use of easily worked irons and steels and alloying the surface only.
8. Save strategic materials by confining the alloying constituents to the surface where they are most needed.
9. Cut costs by replacing two or more conventional surface treatments by one chromizing operation.
10. Improve appearance and performance of many types of ferrous parts.

Thus, it can be seen how in some fields, when properly applied, the process has replaced stainless steel, plating, case hardening, and even cemented tungsten carbide. It must be emphasized, however, that such advantages can be gained only by a careful analysis of all the factors involved and on the basis of a complete knowledge of the service conditions under which the parts in question have to operate.

Shop Problems

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Anodizing Small Nuts

In regard to Shop Problems, December 1952 issue, C.G.A. writes he is having trouble anodizing small nuts in baskets, while having no trouble with larger ones.

We have had a little of the same trouble in the past but have eliminated it by mixing aluminum chips and shavings in with the parts, thus allowing air space in the cam and better flow of solution. It also keeps the biggest majority of the parts from touching each other.

Electro-vs. Hot Dipped Zinc

Question: We have a customer (a nail manufacturer) who would like to know the comparative corrosion resistance of galvanized nails as compared with zinc plated and chromate (bright) finish.

C. N. S.

Answer: The corrosion resistance of a sacrificial metal coating such as zinc is a function of the thickness rather than the way it is applied so that electrodeposited and hot dipped zinc would have the same life for the same amount of coating.

Chromate conversion coatings improve the resistance to red rusting to a small extent. Their value lies in the improved resistance to white salt formation.

Copper Plating Magnesium

Question: Will you please forward any available information to which you may have access regarding copper plating magnesium cast parts to build up worn parts to size.

H. G. P.

Answer: Magnesium is plated by a method similar to that for plating on aluminum, whereby an immersion zinc deposit is first applied to the surface, after which the article is copper plated from a Rochelle salt bath or a fluoride inhibited potassium cyanide bath.

Details, such as preparatory treatment and composition of the immersion zinc solution will be found in the section by Diggin on pages 218-224 of the 1953 edition of the Metal Finishing Guidebook.

Gold Plating Soft Soldered Jewelry

Question: I would like to know what the best procedure would be to cover soft solder on costume jewelry. I tried using brass and copper, but it does not cover for gold plating. I get polished pieces and cannot use too much copper plate or brass.

H. S.

Answer: The best procedure for handling soft soldered costume jewelry is to copper strike and then bright nickel plate before gold flashing.

Without the nickel deposit it is difficult to get gold coverage over the copper strike, especially in recesses. Also, by bright nickel plating, you can copper flash sufficiently to cover the solder and still build up enough brightness.

Pickling Beryllium-Copper

Question: We would appreciate any information you may have on pickling beryllium copper prior to plating. In most cases the copper is received with a very heavy scale due to the heat treatment it receives. We have tried several acid combinations, but in most cases, the metal is attacked too severely before the scale is entirely removed.

F. M. C.

Answer: Heavy scale is best removed from beryllium-copper alloys by soaking in warm 10% by volume sulfuric acid solution. This solution has very little action on the metal.

After pickling, the parts may be given a quick dip in a solution of 4 oz./gal. sodium or potassium dichromate and ½ pint/gal. sulfuric acid to brighten up the surface prior to plating.

Tin-Nickel Baths

Question: We would like to receive some information on the new development on Tin-Nickel electrodeposit process. We understand this is an interesting technical development, and a few pilot plants are in operation in Europe.

If you can give us any data on the above, we would appreciate receiving at your earliest convenience.

W. H. S.

Answer: A summary of the process appears on pp. 61-3 of the August, 1951 issue of METAL FINISHING. The original paper was published in the Journal of the Electrodepositors' Technical Society (London) and we would suggest that you write to the Tin Research Institute, Inc., 492 West Sixth Ave., Columbus 1, Ohio. They may have reprints available.

Hardness of Silver Deposits

Question: Could you give us any information on plating hard silver? Various people in the plating industry have made the statement that there is a method in existence for hard silver plate but we have been unable to locate it. Also, how hard is hard silver?

D. H. R.

Answer: Silver, deposited from solutions containing brighteners, is appreciably harder than dull silver deposits. According to tests made by Hothersall [Met. Ind., London, **48**, 117 (1936)] the diamond pyramid hardness numbers of silver are as follows:

Bright silver: 130
Matte silver: 61-79

This may be compared to annealed silver which has a hardness of about 25 according to the International Critical Tables.

Cyanide in Silver Baths

Question: On page 338 of the 1951 Guidebook I note that the total cyanide is 7.5 oz./gal. and the free cyanide is 5.0 oz./gal. When I subtract the cyanide in the potassium silver cyanide I do not get 5.0 oz./gal. How do you account for it?

Also on page 483, the analysis gives the factor as 0.131 whereas I get the figure 0.174 for my factor.

C. A. P.

Answer: The formula for the silver plating solution does not give total cyanide but the amount of potassium cyanide to be added when making up a solution. 4 oz. of silver cyanide requires 2 oz. of potassium cyanide to dissolve it and form the complex potassium silver cyanide.

For a free cyanide analysis of 5 oz./gal., a total of 7 oz. KCN would therefore be required. Figuring on 95% KCN content of commercial potassium cyanide, 7½ oz. would be required.

The analytical procedure states that the factor 0.131 is for cyanide calculated as *sodium cyanide*. For conversion of the factor to potassium cyanide, multiplying by 1.33 is required, which results in the factor 0.174 which agrees with the figure you calculated.

Buffing, Filtering and Cyanide Control in Silver Solutions

Question: I would like your opinion on the following questions:

1. How many feet per minute should the circumference of a buffing wheel travel for cutting brass, copper and white metal with compounds such as greaseless compound; for tripoli; for color buffing?

2. Can a silver plating solution be filtered through well washed seashore sand without danger of picking up harmful chemicals?

3. Is there much loss in throwing power in a silver solution when sodium cyanide is not added from time to time?

S. H. Y.

Answer: Greaseless compositions are used at speeds between 5,000 and 6,000 linear feet per minute.

Brass, copper and white metal are cut down with tripoli at speeds of 6,000 to 8,000 feet per minute and are color buffed at the same speed.

We would not suggest filtering cyanide solutions through any filter medium containing silica, such as sand, since there is a tendency for the solution to pick up silicates which coat the anodes. Use cellulose types of filter pads.

Cyanide should be added to your silver solution when called for by analysis. The throwing power will decrease slightly if the free cyanide is too high, whereas low cyanide will result in poor anode corrosion and coarse grained deposits.

Adhesion of Paint to Chromium Plate

Question: What methods are available or have been suggested which will make paint (Duco) stick to chromium plated surfaces? It is frequently necessary to paint chromium plated repair parts to match undamaged parts, and we have been unable to make the paint adhere.

N. F. M.

Answer: The most popular treatment for chromium plated surfaces prior to organic finishing appears to be immersion in a 2% chromic acid solution at about 150-160°F. There seems to be some difference of opinion as to whether rinsing after this treatment is beneficial or detrimental, but immersion for periods of up to 4 minutes followed by air drying without a rinse is common practice.

You might write to Rinshed-Mason Co., 5935 Milford Ave., Detroit 10, Mich. for their bulletin on synthetic clear enamels for chromium plate, which contains recommendations for cleaning procedures.

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Recently Granted Patents in the Metal Finishing Field

Patents

Method of Electrolytically Coating and Etching Bearing Surfaces

U. S. Patent 2,620,296. *Dec. 2, 1952. S. C. Wilsdon, assignor to Monochrome, Ltd.*

A process of treating a machine part to provide an electrolytically-deposited bearing surface thereon, which comprises electrolytically depositing a metallic layer on such a part to a depth to provide a bearing surface of substantially a desired final bearing size, covering the electrolytically-deposited bearing surface by a mask having perforations distributed over its area and which is resistant to attack by an electrolytic etching solution, immersing in a bath of an electrolytic etching solution the part having the metallic layer electrolytically deposited thereon and the perforated mask covering such layer, and passing an electric current from an external source through the bath of electrolytic etching solution in such direction that said part constitutes the anode until the portions of the electrolytically-deposited metallic layer exposed through the perforations in the mask to the etching solution are etched to a depth sufficient to form shallow lubricant retaining recesses while the portions of said layer covered by the portions of the mask intervening the perforations therein are not exposed to the etching solution and remain unetched and smooth.

Tarnish Prevention

U. S. Patent 2,621,104. *Dec. 9, 1952. R. H. Prew, assignor to Nashua Corp.*

Material for protecting from tarnish silverware placed in adjacency thereto, comprising a backing one face of which is covered by a pile consisting of relatively long and relatively short textile flock in substantially uniform relative distribution throughout the area of the backing, the flocks being adhesively secured endwise to the face of the backing in upstanding position, the short flocks retaining in the fibers thereof a substance which as compared with the silverware is preferentially susceptible to chemical attack by tarnishing agents in the air, the long flocks being substantially free of such substance.

Polishing Machine

U. S. Patent 2,620,602. *Dec. 9, 1952. C. G. Schenk, assignor to The Fafnir Bearing Co.*

In a polishing machine of the character indicated, a spindle with means for revolubly supporting an inner bearing ring with a concave race groove to be polished, polishing means including mounting means supporting spaced pulleys on parallel axes that are substantially parallel to the axis of said spindle, and a belt supported by said pulleys for polishing contact of one span thereof with the bearing race groove to be polished, means for moving said mounting means generally radially toward and away from said spindle, abrasive-applying means actuable into and out of abrasive-applying relation with said polishing means, and angular-adjustment means effective between said spindle and said polishing means, whereby the axes of said spindle and of said polishing means may be inclined relatively to each other to produce a polishing contact of said belt with the bearing-race groove at an angle to the radial plane of symmetry of the race groove.

Descaling and Brushing Machine, Especially for Rough-Drawn Wire

U. S. Patent 2,620,496. *Dec. 9, 1952. J. Peignier, assignor to Societe Metallurgique de Gorcy.*

In a wire descaling machine, a frame having an aperture for receiv- the wire to be threaded, a casing having a hub rotatably mounted in said frame, said hub having an axial bore in alignment with the aperture in said frame to permit passage of the wire there-through, a pair of brushes having shafts rotatably mounted in said casing transversely of the axis of said bore, the bristles of said brushes being oppositely disposed in such manner that the plane of juncture between the bristle ends of said brushes coincides with the axis of said bore, whereby to permit passage of the wire between the two opposed faces of the brushes, transmission elements secured to the shafts of said brushes for rotating the same, a drum engaged b the wire in its travel with respect to said brushes whereby the movement of the wire rotates the drum, and means connecting said drum with said transmission elements whereby to rotate said brushes synchronously with the movement of said wire.

Treatment of Galvanizing Skimmings

U. S. Patent 2,622,020. *Dec. 16, 1952. C. W. Morrison, assignor to National Zinc Co., Inc.*

The method of recovering zinc from galvanizing skimmings comprising a mixture of metallic zinc, zinc oxide and zinc chloride, which comprises subjecting the skimmings to a thorough grinding operation while immersed in a water solution of sodium carbonate, separating the solid constituents of the resulting ground pulp from the aqueous component thereof, and treating the separated solids for the recovery therefrom of metallic zinc.

Portable Electric Belt Sanding Machine

U. S. Patent 2,621,453. *Dec. 16, 1952. B. S. Oren.*

A portable power driven finishing tool comprising a mounting carriage, a surface finishing device having a substantially planar finishing surface, mounted on said carriage, a handle for guiding said tool over the work, mounted on the carriage, skid means mounted on said carriage extending alongside and adjacent the peripheral edges of said finishing surface for supporting and positioning the carriage with respect to the surface to be finished, spring means acting between said carriage and finishing device for exerting downward pressure on said finishing device to press the finishing surface downwardly with respect to said skid means into engagement with

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the work, and a motor having a rotary drive shaft for driving said finishing device, said handle being rockably mounted to rock about the axis of said shaft.

Chromizing Pack and Method

U. S. Patent 2,622,043. *Dec. 16, 1952. M. S. Roush, assignor to Thompson Products, Inc.*

The method of chromizing copper-infiltered powdered iron compressor blades for turbo-jet engines and the like which comprises packing the blades in a basket embedded in a granular mixture of ferrochrome and titanium dioxide, sealing the packed basket in a retort, purging the retort with hydrogen, heating the retort to chromizing temperatures while continuing the hydrogen purge, flowing hydrogen chloride through the heated retort, continuing the heat treatment and hydrogen chloride treatment until a desired chromized finish has been produced on the blades and until part of the titanium in the pack alloys with the copper in the blades, cooling the retort, purging the retort with an inert gas, removing the basket from the retort, sifting the ferrochrome and titanium dioxide material out of the basket, and washing the remaining blades in the basket.

Grit Blasting Device for Cleaning Pipes and the Like

U. S. Patent 2,621,446. *Dec. 16, 1952. R. S. Russell, assignor to Hydraulic Supply Manufacturing Co.*

A grit blasting device for cleaning pipe and the like, comprising: a housing enclosing a work area having entrance and exit openings aligned generally on a horizontal line; means for moving such pipe on a path through said entrance and exit openings while rotating the same; a plurality of nozzles positioned in the upper portion of said housing and directed to spray on such pipe; said housing having an opening in its bottom and a screen positioned therein to remove large particles of material passing there-through; a hopper positioned below said screen to receive material passing there-through; said hopper having a discharge opening in its bottom; a pressure chamber positioned below said hopper to receive material from said discharge opening; a dump valve on said discharge opening and said pressure chamber being sealed

when said valve is closed; said chamber having a hopper shaped bottom with an egress opening at its apex; a pressure line passing said egress opening and said egress opening connecting with said pressure line in position to deposit material therefrom by gravity feed; a source of high pressure air for said pressure line and said pressure line being connected with said nozzles; and means connecting with the upper portion of said chamber to provide air pressure above materials in said hopper shaped bottom.

Deposition of Metal on a Non Metallic Support

U. S. Patent 2,622,041. *Dec. 16, 1952. P. Godley, 2nd, assignor to National Research Corp.*

The process of vacuum deposition of a metal on a nonmetallic, flexible substrate which yields gases or vapors when heated, said process comprising the steps of passing said substrate through a heating zone evacuated to a pressure on the order of 50 to 500 microns Hg, heating both sides of said substrate during passage through said heating zone to drive from said substrate occluded gases and other volatiles resulting from said heating, said heating being accomplished by advancing said substrate along a circuitous path between a plurality of heating elements so that relatively large areas on both sides of said substrate are being subjected to heat simultaneously, said substrate being advanced through said heating zone at a rate sufficient to permit thorough heating of the body of said substrate, the substrate being heated to a degree sufficient only to drive out volatiles from the body of said substrate, removing said substrate from said heating zone prior to the time when the removal of said volatiles is sufficient to cause substantial embrittlement of said substrate, substantially immediately thereafter advancing said substrate into a coating zone evacuated to a pressure lower than the pressure in said heating zone, generating, metal vapors in said coating zone, condensing said metal vapors on said substrate, and shielding said substrate in said coating zone from vapors driven from said substrate in said heating zone, the area of substrate being heated at any instant of time being greatly in excess of the area of substrate being coated at any instant of time.

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for example: IRIDITE® (AL-COAT) REDUCES NEED FOR ANODIZING
Simple chemical dip; immersion time only 10 seconds to 2 minutes; no sealing dip; color is clear or yellow depending upon your requirements; salt spray resistance equivalent to 20 to 30 minutes of anodizing, eliminates need for costly racks and electrical power.
WANT TO KNOW MORE? Write for literature and send production samples for free test processing. See "Plating Supplies" in your classified telephone directory or write direct.
Iridite is approved under government specifications.
ALLIED RESEARCH PRODUCTS
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Manufacturers of Iridite Finishes
for Corrosion Protection and Paint Systems on Non-Ferrous Metals; ARP Plating Brighteners.
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Put them INTO your Plating!

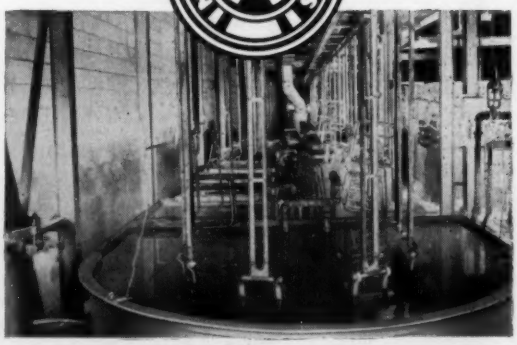
Get more and better plating for less

With complete control of the sequence plus the conveyor handling of the parts, a Meaker machine gives greater production, reduced costs, uniform predetermined quality and less turnover in personnel due to better working conditions. Meaker equipment is tailored to the job requirements in plating, anodizing, pickling and cleaning, bonderizing or other processes involving a sequence of washes, rinses, and dips. Get full particulars from The Meaker Company, 1635 South 55th Avenue, Chicago 50, Illinois.

MEAKER

- Full Automatic and Semi-Automatic Electroplating Equipment
- Strip Steel Plating Equipment
- Wire Galvanizing Equipment
- Strip Steel Electrocleaning Lines
- Pickling Machines
- Processing Conveyors
- Motor Generators for Plating
- Rectifiers for Plating

MEAKER PRODUCTS



Meaker Return-Type Automatic Plating Machine

PLATING EQUIPMENT FOR OVER 50 YEARS

Apparatus for Polishing Continuous Strip Material

U. S. Patent 2,621,445. *Dec. 16, 1952. D. A. Wallace, assignor to Chrysler Corp.*

An abrading unit comprising a base structure having a work support, a carriage support mounted on said base structure in spaced relation to said work support, a carriage rotatably mounted on said carriage support disposed between the latter and said work support, a plurality of arcuately spaced spindles mounted on said carriage in parallel relationship to the rotative axis thereof, a fixture swingably mounted on each spindle and including journal bearing means, an abrading tool journaled in the journal bearing means of each of said spindles, each abrading tool having a pinion fixed on one end and an abrading element on its opposite end provided with an abrading surface disposed to operate upon work supported on said work support, a stationary ring gear on said carriage support, a counter shaft member journaled on each of said spindles having a set of gear teeth meshed with said ring gear and an axially spaced set of gear teeth meshed with a pinion of one of said tools respectively, said fixtures being swingably adjustable on said spindles into varying spaced relationship with respect to the rotative axis of said carriage while said ring gear, pinions and sets of gear teeth are retained in mesh, and means operatively connected to each of said fixtures and adapted to releasably connect said fixtures to said carriage to prevent displacement of said fixtures from their respective adjusted positions relative to said carriage.

Rust Inhibiting Composition

U. S. Patent 2,623,887. *Dec. 30, 1952. A. H. Matuszak, assignor to Standard Oil Development Co.*

As a new composition of matter a mixed partial ester of a polyhydroxyl alcohol selected from the group which consists of sorbitan and pentaerythritol, the esterifying group being oleic acid and ethane sulfonate.

Black Chromium Plating

U. S. Patent 2,623,847. *Dec. 30, 1952. L. O. Gilbert and C. C. Buhman.*

The process of producing a dark-gray to black, corrosion resistant, adherent film upon a conductive base

which comprises making the base the cathode of an electroplating cell in which the electrolyte comprises an aqueous solution of 275 g. of chromic anhydride and 200 ml. of glacial acetic acid per liter of solution and electrolyzing at a cathode current density of from 15 to 1,000 amperes per square foot.

Spent Pickle Liquor Treatment

U. S. Patent 2,623,849. *Dec. 30, 1952. H. L. Peterson.*

A method of treating spent ferrous metal pickling liquor containing mineral acids which consists in neutralizing the mineral acids and precipitating the metallic oxides therein by introducing into the spent liquor a neutralizing treating agent having a saponified fat content and an alkali content in a quantity sufficient to effect a curd formation and removing the curd.

Corrosion Prevention

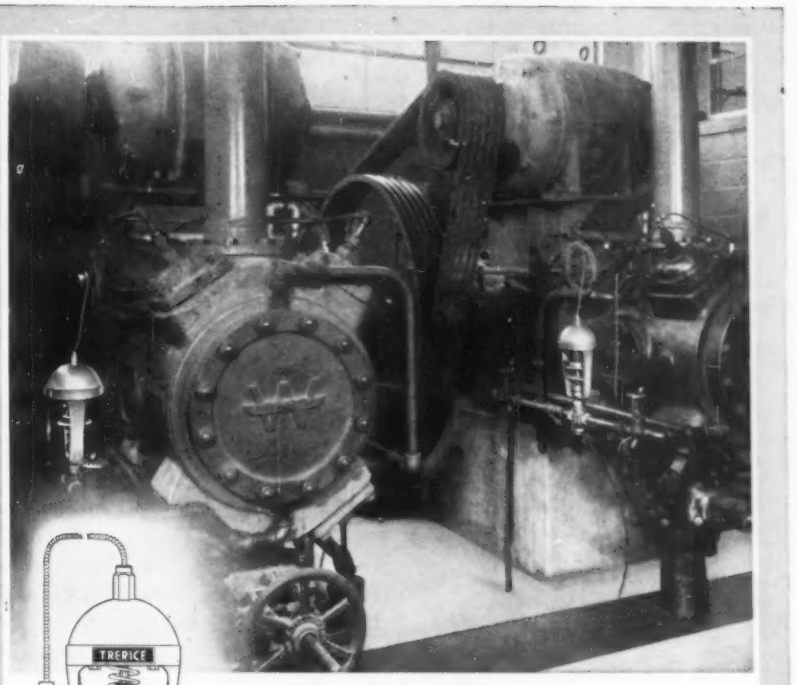
U. S. Patent 2,623,835. *Dec. 30, 1952. J. A. van Melsen, assignor to Shell Development Co.*

In a method of inhibiting corrosion and rusting of metal surfaces by applying to said metal surfaces a corrosion-protective composition comprising a relatively volatile non-polar liquid carrier and an effective corrosion-inhibiting agent, the improvement which comprises utilizing as the corrosion-preventive composition a composition comprising normally liquid polar and non-polar vehicle boiling below 600°F. and from about 0.1% to 2% by weight of a polyvalent metal-hydroxy aromatic monocarboxylic acid salt.

Tin Coating Aluminum

U. S. Patent 2,624,684. *Jan. 6, 1953. S. Heiman, assignor to Philadelphia Rust-Proof Co.*

The method of coating aluminum articles with an adherent, smooth deposit of tin which comprises cleaning the aluminum article to remove substantially all of the surface oxide film and immersing the cleaned aluminum article in an aqueous bath consisting essentially of water, an organic addition agent consisting essentially of a water-soluble glue and a hydroxy aromatic compound, a water-soluble tin salt and a water-soluble fluoride, the concentration of tin salt in said bath being in the range of 0.05 N to 7.25 N and the concentration of fluoride being in the range of 0.1 N to 14 N.



This TRERICE Self-Operating Controller *Paid for itself in Sixty Days!*

. . . installed in a Detroit office building.

Two small air compressors, cooled by ¾" water lines, operate seven days a week — one at night, the other during the day. Meters provide a close check as to the amount of water used. After installing a Trerice self-operating temperature controller, a check showed a saving of over 48,000 cubic feet of water in two months (as compared to figures for the previous year). Savings amounted to $90.91 — and the Trerice instrument *cost but* $87.30.

You, too, can enjoy real savings like these. While this is a cold water application, it would be equally effective to control steam to hot water tanks, pasteurizers, pre-heaters, storage rooms, vats, plating tanks, cookers, feed-water heaters, water jackets, etc.

SEND THIS COUPON TODAY

Yes, I want *more* information on a Trerice Self-Operating Temperature Controller.

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11

H. O. TRERICE CO. 1420 W. LAFAYETTE BLVD. DETROIT 16, MICHIGAN

Manufacturers of Temperature Instruments Since 1923

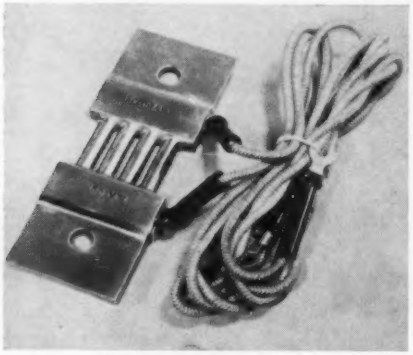
BRANCHES IN PRINCIPAL CITIES

Recent Developments

New Methods, Materials and Equipment for the Metal Finishing Industries

Direct Current Ammeter Shunts

Rapid Electric Company, Dept. MF, 2881 Middletown Road, New York 61, N. Y.



The above manufacturer has announced a complete line of direct current ammeter shunts designed for use with 50 millivolt meter instruments. Sizes range from 150 to 10,000 amperes. These units are calibrated to within ½ to 1% accuracy and are complete with 10 foot calibrated leads. Each shunt is designed to maintain its accuracy at 100% overload, thereby making it applicable for use at twice the rated capacity with 100 millivolt instruments. All units are constructed with solid copper ends and solid manganum rods between copper. Due to the extra heavy duty construction and the extremely low temperature coefficient of the metal alloy, perfect accuracy is maintained when used at maximum capacity and at ambient temperature up to 350°F. Force fitting of over ½ inch of manganum rod into both metals has produced an instrument that is not only impervious to extreme shock but will resist parting force of many times its ampere rating in pounds.

This development has reduced the cost of high quality shunts and makes immediate delivery possible.

New Decorative Plating Processes Requiring No Nickel

Promat Division, Poor & Co., Dept. MF, 851 S. Market St., Waukegan, Ill.

The above company has developed two decorative plating processes for use on parts commonly having a copper-nickel-chrome finish. No nickel is employed in the processes. They are designated as Probrite CR-723, a buffing grade deposit, for parts that can be color buffed after plating.

Both finishes can be deposited over steel or copper. They can be readily chrome plated. A new Promat Sealer for use over the chrome plating prolongs life of the finish.

Brilliance of the finishes is reported comparable to copper-nickel-chrome. Protection of steel against red rust is claimed to be as high as 200 hours in a standard salt spray test when Probrite is chrome plated and sealed. This is approximately twice the test life of good quality copper-nickel-chrome.

Technical data is available upon request to the manufacturer.

Heavy Polishing Lathe

Hammond Machinery Builders, Inc., Dept. MF, 1600 Douglas Ave., Kalamazoo, Mich.

The above company annonuces a new 10 horsepower Model 10 VRO variable speed polishing and buffing lathe, as illustrated.

This new lathe has a speed range of 1,500 R.P.M. to 3,000 R.P.M. Speed is changed instantly while lathe is running by turning the dial control.

The increasing demand for a heavier variable speed lathe prompted Hammond to add this 10 horsepower size to their wide line of polishing and buffing equipment.

Safety Grip Glove

Edmont Manufacturing Co., Dept. MF, 1276 Walnut St., Coshocton, O.

A new type safety grip finish is now being used on the Edmont line of Redmont coated fabric work gloves. Extending from the middle of the palm to the ends of the fingers, the improved finish offers three important advantages—better wet grip, longer wear, won't chip, crack or peel. The new finish is made of a material which cures into and becomes a part of the base Neox (reinforced Neoprene) coating. Premium quality Redmont gloves are available in five styles ranging from a fully coated knitwrist to an elbow-length gauntlet—all with the improved "safety grip" finish. The 12″ fully coated gauntlet is illustrated.

New Wyandotte Formulas Reduce Foam Formation

Wyandotte Chemicals Corp., Dept. MF, Wyandotte, Mich.

New formulas recently perfected and field-tested by the company's Research Division reduce foam formation up to 50% in electro cleaning solutions as shown in the photo above. The new formulas now apply to the following products, Wyandotte F. S.,

LEA Copper Glo

with the Ronal High Speed Bright Copper Plating Process*

TOPS in Brightness plus Throwing Power and Plating Speed

We take it that you, as is the case with countless other platers, are interested in getting maximum production from your existing equipment. If your problem is one of obtaining a bright, soft copper with a minimum of tank tie-up time, LEA Copper Glo can solve this in a way you cannot afford to overlook.

LEA Copper Glo gives you brilliance with exceptional speed of deposition and excellent throwing power. Its high speed plating characteristics (Hull cell bright current density range 10-60 amperes/sq. ft. for standard formulations) permits production increases of from 30% to 60%, using existing equipment.

Plating minutes are valuable to you. Check up on Lea Copper Glo by the Ronal Process. In addition to brightness and high current density operation, it offers such added operating advantages as greater throwing power, ductile deposits, elimination of wetting agents and low copper concentrations.

* *The Ronal Bright Copper Process is a development of Ronal Chemicals Inc., Brooklyn, N. Y., for which process patents are pending.*

SAVE NICKEL . . . Chrome Plate Directly on LEA Copper-Glo Copper

Burring, Buffing and Polishing . . . Manufacturers and Specialists in the Development of Production Methods, Equipment and Compositions

LEA®

THE LEA MANUFACTURING CO.
16 Cherry Avenue, Waterbury 20, Conn.
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Put Your FINISHING PROBLEMS

IN A

HENDERSON
TUMBLING BARREL

Sided Wood Barrel

For nearly ¾ of a century HENDERSON BROS. has been helping manufacturers solve their Tumble Finishing problems with a wide variety of Tumbling Barrels . . . Sided Wood Barrels, Round Wood Barrels, Perforated, Cast Brass, Cast Iron, Welded Steel Barrels and Rubber Lined Barrels in the Tilt type and Horizontal Type for Bench and Floor installations. Where special processes call for special barrels, Hendersons is prepared to design and construct Tumbling Equipment to customer specification.

Write us, outlining your particular problem. Our Engineering and Development Service will be glad to make recommendations.

Perforated Tilting Barrel

Welded Steel Barrel - Polygonal

Since 1880 Designers and Builders of Tumbling Barrel Equipment.

THE HENDERSON BROS. COMPANY
135 S. LEONARD ST., WATERBURY, CONN.

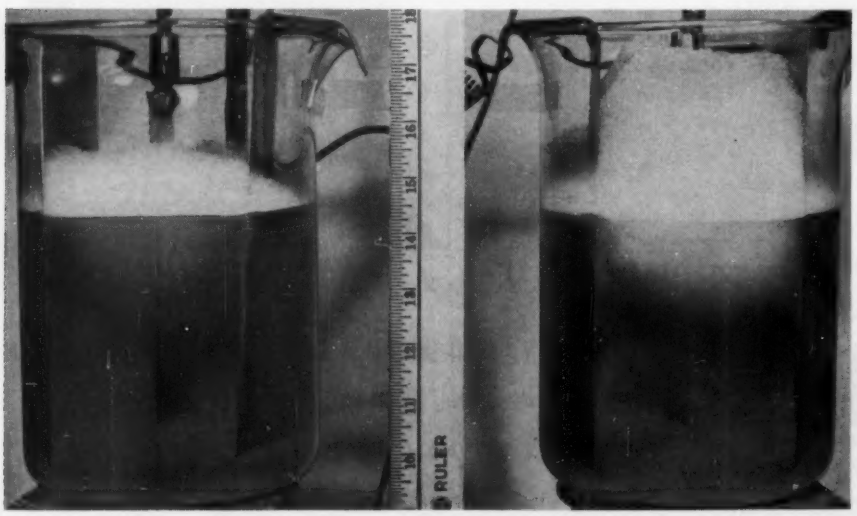
Wyandotte No. 90 and Wyandotte B. N.

In the photo below, Wyandotte F. S., in beaker at left, and a leading competitive product in beaker at right, were given the following identical treatment:

Current density—50 amps. per square foot. Temperature—130°F. Concentration—8 oz. per gallon. Operating time before photo—1 hour.

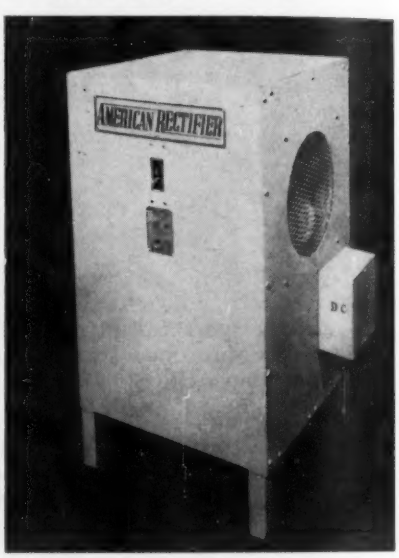
In addition to reducing foam by better than 50%, as shown in photo, Wyandotte F. S., No. 90 and B. N. are now less dusty than other products used for metal cleaning.

Wyandotte Chemicals claims that using these newly formulated products minimize workers' complaints normally caused by coughing, sneezing and skin irritations. The likelihood of explosions from foam trapped hydrogen gas is also reduced with these newly formulated Wyandotte products.



Stock Rectifiers

American Rectifier Corp., Dept. MF, 95 Lafayette St., New York.



This firm recently announced that standard unit rectifiers—from 3 K.W. to 50 K.W. are now in stock, available for prompt delivery. The elimination of the delays involved in custom building is expected to be welcomed by users who have discovered the many benefits of keeping their DC equipment working on AC while retaining all the advantages of direct current equipment.

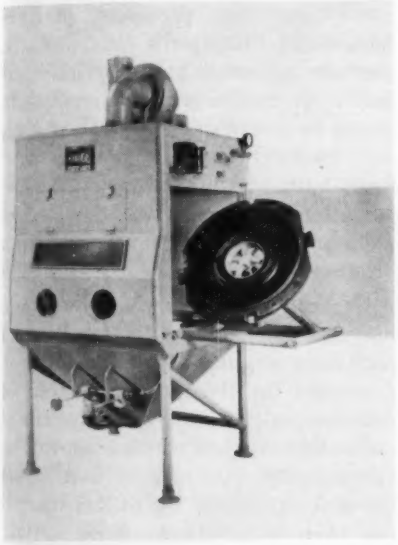
Units now in stock range from 3 K.W. to 50 K.W., 125 or 230 volts D.C., output and either fixed or variable voltage, D.C. units to accommodate any A.C. voltage or frequency input. Also available upon request are standard input voltages at 60 cycles. All American Rectifiers are claimed to be tested with a 200% overload adding complete dependability to ease

and economy of operation. A free brochure explaining the application of American Rectifiers to various operations is available upon request from the manufacturer.

Liquid Abrasive Blasting Machine

R. W. Renton and Co., Dept. MF, 805 Addison Road, Cleveland 3, O.

A redesigned Jet Blast liquid abrasive blasting machine designed to clean, finish, burr, blend or etch a wide variety of parts is now available. This new machine has been engineered for around-the-clock use without costly down-time for maintenance. The liquid slurry is drawn up by siphon injection and propelled from the blasting nozzle by means of a high velocity air stream. The only moving part within the cabinet is the blower which is used to ventilate the cabinet. Consequently, there are no critical wear points which might necessitate frequent servicing.



The new machine features maximum versatility. It is designed to handle abrasives ranging from 60 to 5,000 standard screen size, and new design permits fast change-over of abrasive slurry. Reversible pump located beneath cabinet effects complete change in less than 5 minutes. A special method of maintaining the slurry in suspension permits higher concentration of abrasive at the point of work and thereby increases speed of operation.

Size of abrasive particles, concentration of abrasives in solution, the distance between nozzle and work, and the supply air pressure can be varied to produce the results desired. The machine handles the most delicate cleaning problems without surface damage or dimensional alterations. It is particularly effective in removing rust, scale and other deposits, and the clean matte surface which it produces increases adherence of paint, porcelain, rubber or electroplated metals. It can effect any desired finish on any flat or irregular surface. Sharp edges are retained, and metal removal can be held to 0.0001-inch.

Because the machine is engineered for maximum simplicity, operators require little training. Work is inserted through access door on side of watertight cabinet, and operator reaches in through gauntlet-protected armholes. Work is held in one hand or placed on work table, while abrasive stream is directed by other hand. Full control is exercised over operation by means of conveniently located padded knee pedals. One governs the flow of abrasive slurry from the nozzle, and the other regulates cleaning of light and observation port.

The Jet Blast machine is available from stock in three standard models and can be furnished in almost any size required. It can be equipped with a turntable to speed handling of pieces and can be furnished with up to eight fixed spray guns. In the larger models, the jets can be arranged to produce automatic or semi-automatic operation. Because the machine is compactly built, it is especially adapted to dual machine set-up for production line operation. This permits the successive use of two sizes of abrasives, one for rough cleaning and the other for fine finishing.

Satisfactory metal cleaning, *particularly* before plating or vitreous enameling, demands *complete* removal of chips and all other solid dirt, as well as grease or oil.

YOU'VE GOT TO HAVE SCRUBBING ACTION as well as solvent action. That's why the degreasing method, very satisfactory on oil and grease, falls down when chips and solid dirt have to be removed.

GET IT WITH THE RIGHT MACHINE

Magnus Aja-Dip Cleaning Machines supply a unique mechanical scrubbing and shearing action for removal of solid dirt. In these machines the work *itself* moves up and down in the cleaning solution many times a minute. Your Magnus cleaner works even more satisfactorily in these machines because of far better contact with the dirt. In addition you get positive and vigorous *mechanical* action on *every* surface of the work... even in areas not reached by ordinary cleaning solutions or methods of agitation.

A Size to Meet Your Needs

The Magnus Line of Aja-Dip Cleaning Machines gives you batch cleaning that's so simple and speedy that it is practically a one-man continuous job. Available in capacities from 75 to 2200 lbs. per load.

PUT YOUR PROBLEM UP TO US. *We can help you save man-power and cleaning dollars. We're ready to show you what we can do... either in your own plant or in the Magnus Pilot Laboratory.*

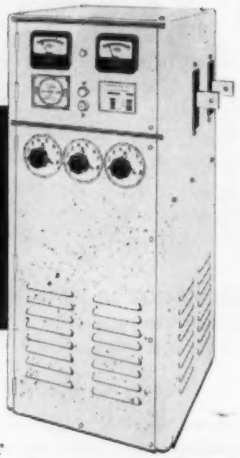
magnus

MAGNUS CHEMICAL CO., INC.
11 South Avenue, Garwood, N. J.
In Canada—Magnus Chemicals, Ltd., Montreal
Service Representatives in Principal Cities

RICHARDSON ALLEN RECTIFIERS

an unfailing D-C SUPPLY for quality plating

ANNOUNCING
PERIODIC REVERSE
You may now obtain a R-A Periodic Reverse Unit for electroplating generators, and one for electroplating rectifiers up to 2,000 amperes.

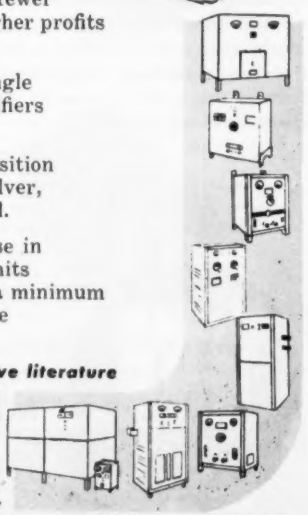


For increased production, improved quality, fewer rejects, lower labor costs—which translates into higher profits—use Richardson-Allen dependable rectifiers.

The basic R-A Rectifier is widely used where a single voltage or current is needed or where several rectifiers are to be paralleled.

For electroplating chrome or bright nickel a 22-position tap switch is supplied. For electroplating gold or silver, and for anodizing a 36-position tap switch is used.

A special Heat Exchanger unit is available for use in corrosive atmospheres. This R-A development permits operation at elevated ambient temperatures with a minimum temperature rise. Long, uninterrupted, dependable service is assured.



write for descriptive literature

RICHARDSON-ALLEN CORPORATION
a manufacturing affiliate of
WESLEY BLOCK AND COMPANY, 39-15 MAIN ST., FLUSHING, N. Y.
IN CANADA: Richardson-Allen of Canada, Ltd., 370 Victoria St., Toronto, Ont.
LEADING POWER CONVERSION SPECIALISTS

Nickel-Nickel Phosphide Non Electrolytic Plating Process

General American Transportation Corp., Dept. MF, 135 South LaSalle St., Chicago 90, Ill.

William J. Stebler, executive vice-president of the above firm, recently announced the availability of an immersion process of nickel plating which greatly stretches the available nickel supply. This firm will immediately build two new plants, one in East Chicago, Ind., and the other in Los Angeles, Calif., to utilize the new process. These plants are expected to be in operation by the third quarter of 1953. Thereafter, other firms will be licensed to use the process since its applications are so wide that no one organization could meet all demands.

The new process, which requires no electrolytic equipment, has been named "Kanigen." It is said to promise remarkable economies in many industrial applications over customary methods, and in addition makes it possible to plate almost any solid substance with a dependable and predictable thickness of a superior, non-porous plate. "It is so completely manageable," Mr. Stebler states, "that it opens up vast new possibilities: intricate valves and other products previously impossible to plate successfully, can be covered thoroughly; parts subject to hard wear and abrasion may be continuously coated and hardened far beyond the capacity of the parent metal; over-machined parts may be brought back to proper tolerances; parts previously machined of Monel metal and other corrosion-resisting materials can now be of cast steel and plated to a thickness of 3 mils with assurance that the plate will nowhere vary from that thickness—with a consequent saving of expense and critical material."

The process, it is claimed, will plate any article uniformly, regardless of size or shape, and has proved satisfactory for the production-line plating of steel, copper, brass, bronze, stainless steel and aluminum. Tests on plastics and magnesium indicate that these materials will prove practical for "Kanigen" plating.

Because of its greater efficiency this new process will provide important savings in critical nickel, which is extremely important in view of the current shortage of nickel. It is estimated that equivalent plate protection can be achieved with ⅓ to ½ the nickel required by other processes, partially because of "Kanigen's" non-porosity, partially because it plates so uniformly that it is unnecessary to overplate in places to assure ample overall plating, and finally because it takes 2 or 3 times more nickel to provide the same corrosion resistance with the electroplating process as is required with "Kanigen."

General American, which owns and operates the world's largest fleet of tank cars, originally set out to develop a process for the interior coating of cars designed to carry corrosive chemicals and materials which must not be contaminated by "pick-up iron" from the tank car metal. Up to this time, it has been necessary to finish certain tank car interiors with several coats of baked-on enamel—a process which is expensive, time-consuming, and lasts only 3 to 5 years. It was believed that nickel plating would prove the ultimate solution, but the continuous electroplating of so large a surface as the interior of a tank car is very difficult under present limitations of the electroplating process.

General American's research group, according to Stebler, succeeded in developing the "Kanigen" process through the reduction of nickel by the use of hypophosphites, a principle upon which the National Bureau of Standards under the direction of Dr. Abner Brenner had done considerable work several years earlier. After the process was perfected in the labora-

tory, a pilot plant was built in East Chicago in the summer of 1952 and has been in constant service since. Because the throwing power of this process is 100%, it has been found practical for pieces of any shape or size, and will prove eminently satisfactory for its intended purpose—the interior coating of tank cars. This, according to Stebler, will be the next step after construction of the presently planned plants. A special unit is to be designed large enough to accomodate tank cars and large vessels as soon as a nickel supply is assured for this purpose.

"Kanigen" plate is a nickel-nickel phosphide composition. Normal "Kanigen" platings run about 5% to 8% phosphorus and have a Vickers hardness of 550-650. Its adhesion is excellent. The thickness is astoundingly uniform. "Kanigen" is usually within 5% of average thickness, while electrolytic nickel can run from 25% to 200% in variations between minimum and maximum. "Kanigen's" resistance to corrosion far exceeds that of electroplating in similar applications because of its non-porosity and thorough coverage, regardless of size, shape, indentations, or irregularities. In typical applications, even on a large scale, "Kanigen" is not likely to show any pores even at plating thicknesses of ½ of 1,000th of an inch, hitherto a quality impossible of attainment.

Since neither design nor size offers any complications to the "Kanigen" process, and because of the hardness of "Kanigen" plate, large vessels, tanks, chemical process equipment, valves, pipe structures and similar objects can be fabricated of any desirable and easily-worked material, assembled, and then given a continuous coating of nickel in whatever thickness is desired. At present this thickness may be controlled when desired to within 1/10,000ths of an inch, and further refinements in progress will, it is felt, reduce this tolerance considerably.

Because of its wearing qualities, many avenues of application open up in instrument gearing and precision manufacturing. Its application to brass and bronze is apparent, and it has already been used to plate Monel and stainless steel to protect intricate parts from constant abrasion as well as corrosion. "Kanigen" may also be used to build up and reclaim small parts which have been machined beyond acceptable tolerances—a factor which has many possibilities in salvaging expensive parts which might otherwise need to be rejected.

One of the most vital fields for application is in handling difficult chemicals. Here "Kanigen" will plate vats, mixing units and all connections, including the interiors of valves and other devices with sufficient coating to protect against any type of corrosion which will not affect nickel.

Wheels CUT FASTER, LAST LONGER
When treated with
Park
KOLD-GRIP
POLISHING WHEEL CEMENT
KOLD GRIP POLISHING CEMENT
378
Park
CHEMICAL COMPANY
KOLD-GRIP Polishing Wheel Cement, laboratory-controlled through every step of production, will arrive at your plant ready for use! Viscosity is constant, regardless of normal temperature variations and the cement can be applied directly from the container . . . without mixing or heating. Kold-Grip is clean, odorless and very easy to handle.
Coarse or fine-grain abrasives set up right for fast cutting efficiency. Substantial savings are effected through longer over-all wheel life, fewer set-ups and reduced wheel inventory.
Wheels dry rapidly, are unaffected by humidity changes, and may be stored in any convenient plant area.
Let our polishing engineer demonstrate Kold-Grip for you, or send for free sample, telling us the metal to be polished, grain sizes to be used, and drying facilities available. We can help you if we hear from you.
• Liquid and Solid Carburizers • Cyanide, Neutral, and High Speed Steel Salts • Coke • Lead Pot Carbon • Charcoal • No Carb • Carbon Preventer • Quenching and Tempering Oils • Drawing Salts • Metal Cleaners • Kold-Grip Polishing Wheel Cement
Park
CHEMICAL COMPANY
8075 Military
Detroit 4, Mich.

Low Voltage Switchgear

General Electric Co., Dept. MF, Schenectady 5, N. Y.

A complete new line of low-voltage drawout switchgear (600 volts a-c and below) with standardized compartment construction and completely new air circuit breakers, has been announced by the company's switchgear department at Philadelphia, Pa.

Complete equipments having whatever circuit pattern is needed can be manufacured for shorter shipment from standardized circuit breaker, control—instrument and bus compartment building blocks.

Able to withstand 30-cycle momentary currents equal to their interrupting ratings (15,000 to 100,000 amperes), the new air circuit breakers used in the equipment make it possible for the first time to have fully selective tripping with all breakers applied up to their full interrupting ratings. Continuous current ratings range from 15 to 4,000 amperes.

An important feature of the new breakers is the stored energy closing

Behind the 8 Ball with Your Anodes?

HERE ARE TWO PRACTICAL SUGGESTIONS DESIGNED TO HELP YOU!

1 CONVERSION OF SCRAP NICKEL TO NEW ANODES

New Jersey Metals can help you stretch your present nickel supply by melting and recasting your grade "A" nickel scrap, anode ends and stubs into new nickel anodes. Complete anode conversion—including cutting and finishing—is completed in a matter of days. What's more you actually save 5 to 10 cents per pound over the purchase of new anodes. The purity content of the new anodes returned to you is guaranteed. Quotations on any quantities—laboratory analysis is free.

2 ZINC BALL ANODES

Here's the newest addition to the New Jersey Metals line. Manufactured of the highest grade zinc, New Jersey Metals zinc ball anodes are guaranteed to be 99.99+% pure virgin zinc. Designed in the most efficient shape, these anodes provide the greatest plating surface per pound of any anode. Easier to handle, they facilitate faster production and can be used with either ball holder or anode basket.

Furthermore, you're buying all metal—no dross as hidden losses or blow holes to carry contaminating matter to your plating solution.

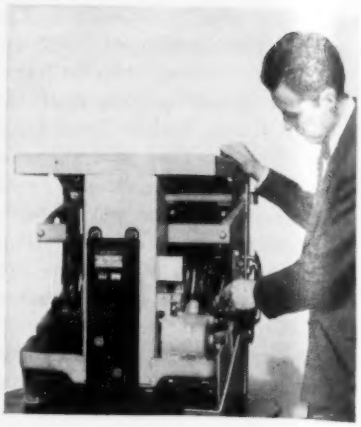
Whether it's converted nickel anodes or pure zinc ball anodes, it will pay you to look to New Jersey Metals for your anode requirements. Call ELizabeth 2-6465 or write . . .

New Jersey Metals Co.

Serving industry from coast to coast since 1921

714 ROCKEFELLER ST., ELIZABETH 2, N. J.

N.J. METALS



mechanism used for electrical operation of 50, 75 and 100 k.v.a. interrupting rated breakers. All earlier brekaer designs have depended upon maintenance of control power during the entire closing operation to drive a motor or solenoid. The new mechanism insures closing and latching against full rated short circuit current even though control voltage is completely lost when the breaker contacts first touch. This is accomplished by energy stored in a spring before the closing operation is begun.

All breakers are equipped with triple-characteristic over-current tripping devices which provide long or short time delay or instantaneous characteristics as required for different applications.

Corrosion Resistant Rubber Base Coating

Saran Protective Coatings Co., Dept. MF, 2415 Burdette Ave., Ferndale (Detroit) 20, Mich.

Formulated with a heat-stable thermoplastic resin obtained by the copolymerization of styrene and butadiene, this coating, known as Pliogard, is finding widespread use in chemical plants, plating plants, etc. It provides a durable and lasting finish for floors, walls, structural steel, tanks, ducts, process equipment and is used wherever preventive maintenance is required.

It produces films which are exceptionally tough, hard and inert to most chemicals, has excellent adhesion to all clean, dry surfaces and gives good results with minimum surface preparation. No primer is needed. Two coats provide excellent protection against fumes, vapors and occasional spillage of acids and alkalies. Not affected by fats, oils, or greases. It is extremely heat resistant; temperatures up to 250°F. continuous, and even higher

for short periods of time, can readily be accomodated. It can be applied over old painted surfaces if the surface is clean and the old coating firmly adherent.

The coating is non-oxidizing and non-saponifiable. Ordinary paints in the presence of moisture and free alkali are converted to soaps and soon destroyed. Where unusually high alkali resistance is a requirement Pliogard produces films of excellent durability.

Pliogard coatings have an exceptionally high solids content, some colors in excess of 50%. Notwithstanding the high solids content, Pliogard can be applied with ease by either brushing, spraying or dipping. These coatings air dry quickly. They are dust-free in less than 30 minutes and can be recoated by spraying in four to six hours or by brushing in six to eight hours. Pliogard is available in fourteen colors and also clear. A color card folder which also gives detailed application instructions can be had from the manufacturer upon request.

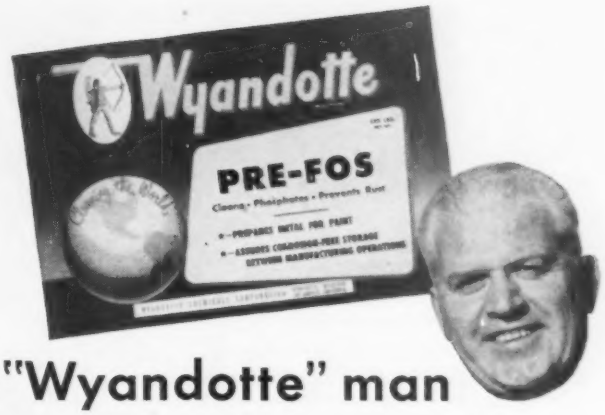
"Permanized" Bias Sisal Buffs

American Buff Co., Dept. MF, 2414 S. LaSalle St., Chicago 16, Ill.

A rapid increase in the use of Bias sisal buffs by metal finishers is reported by *Ben P. Sax*, president of the company. According to Mr. Sax, this increase is largely due to the fact that the company's exclusive "permanizing" process locks the sisal fibers permanently together, reduces fraying and prevents excessive hardness.

The company's Bias sisal buffs are made in Merida Yucatan, Mexico, from only new, top-grade iSsal fiber cloth which is woven to their own specifications and under their control. Regular visits are made to Yucatan by company executives, to insure uniformity of quality.

These buffs have the added advan-



WYANDOTTE CHEMICALS

Let the "Wyandotte" man Give YOU the sensational

PRE-FOS PERFORMANCE STORY

SPEEDED PHOSPHATING 50%!

"Wyandotte Pre-Fos cleans better; deposits a fine-grained phosphate coating which helps hold paint and prevent rust. Pre-Fos speeds up our phosphating 50%; is cheaper and lasts longer." *Detroit, Michigan**

SUCCEEDED WHERE OTHER PHOSPHATING CLEANERS HAD FAILED!

"In our operation, we had previously tried most of the other available phosphating cleaners with only partial success. But we have found that Pre-Fos gives us superb paint adhesion, excellent cleaning and rust protection. Wyandotte Pre-Fos has proved completely successful." *Chicago, Ill.**

Other reports on Pre-Fos:

"We now run one to two weeks longer before dumping!"

"Humidity cabinet resistance improved 80%!"

"Best cleaning our washer has ever produced!"

CUT COSTS UP TO 75%!

"With Wyandotte Pre-Fos we get better cleaning and paint adherence, elimination of hard-water scaling. Our cost formerly was four times as great as it is now with Pre-Fos!" *Canton, Ohio**

ELIMINATED ONE PRODUCTION STAGE!

"Pre-Fos enabled us to completely eliminate one stage in our operation. We cut production time, saved valuable shop space, obtained better cleaning and paint preparation." *Detroit, Michigan**

Call in your Wyandotte service man today. Ask him to show you how amazing Pre-Fos can help you. Send the coupon for more Pre-Fos information. *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Also Los Angeles 12, California.* *Names on request

CLEANING THE WORLD

Largest manufacturers of specialized cleaning products for business and industry.

Wyandotte CHEMICALS

Helpful service representatives in 138 cities in the United States and Canada

Wyandotte Chemicals Corporation
Wyandotte, Michigan

Please send data on PRE-FOS:

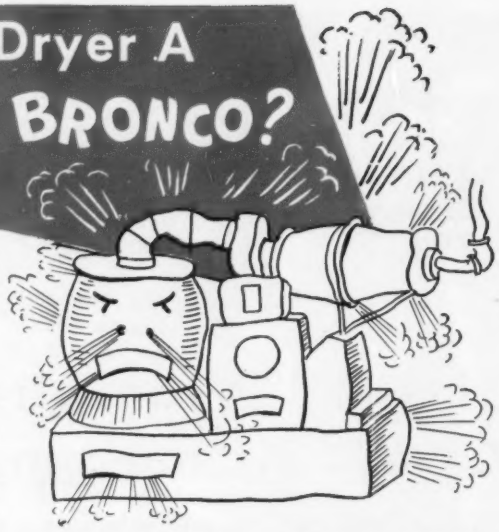
Name_____

Firm_____

Address_____

City_____ Zone____ State_____

Is Your Dryer A BUCKING BRONCO?



In order for a centrifugal dryer to stay put it should be heavy. That's why the modern Nobles Dryer is about twice the weight of most dryers. Extra weight is one of the reasons for its stability, its freedom from vibration, its smooth operation, and long trouble-free life.

It's all new in design and principle. A powerful suction fan *draws* the air completely through this modern Nobles Dryer and exhausts it at the bottom! Electric or steam heaters are mounted in the cover of this machine of advanced design for a saving of space and elimination of heat loss.

Air moving equipment isn't an extra. The powerful suction fan is an integral design feature of each machine. A brake pedal extending around the entire work area controls an internal, expanding hydraulic brake for quick, smooth stops.

Why not take the first step now toward modern quick drying and lowest costs?

NOBLES ENGINEERING & MANUFACTURING CO.

617 EAST SEVENTH STREET ST. PAUL 6, MINNESOTA

Write Today for the FREE NOBLES DRYER BROCHURE

tage of being always uniform as to specific weave. Ranging from light to medium weights, and from loose, open weaves to very tight crest weaves, they are especially adaptable for finishing stainless steel and aluminum as well as all ferrous metals. Both the patented new "centerless" type, and regular styles with permanent steel or cardboard centers are proving extremely popular.

Universal Cleaning Spray

Kelite Products, Inc., Dept. MF, 1250 North Main St., Los Angeles 12, Calif.

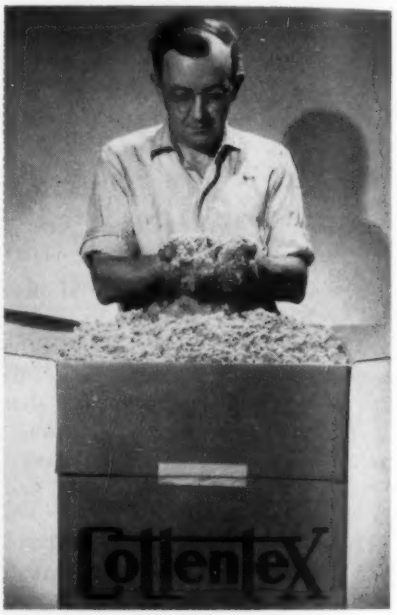
Applied by a hand-sized pressure spray gun, patented Kelite Spray White is a new industrial cleaner now being marketed as the "First Universal Cleaner." It removes grease, oil, wax, gums, dirt, dye, ink, cutting soap, light carbon, etc., with complete safety to all metals, plastics, rubber, porcelain, composition, concrete or wood when used according to directions. It is expected to have far-reaching effects on many phases of industrial cleaning, since it accomplishes rapid cleaning without heat, odor, fumes, solvents, fire-hazard or danger to skin.

Virtually all cleaning jobs are completed merely by spraying-on and wiping-off. Hard rubbing or scouring are seldom required. The sturdy spray gun is charged with air pressure from any source, can be refilled in a few seconds and holds enough Spray White for several hours of average cleaning.

Further information may be had by writing the manufacturer. Ask for Bulletin 126.

Degreasing Agent for Use in Tumbling

Cottentex Mfg. Co., Dept. MF, 407K E. Wells St., Milwaukee, Wis.



A new finely ground cellulose fibre material with exceptionally high absorbency, called Cottentex, is now available for use in degreasing and drying operations employing tumbling barrels. Absorbing more than 8 times its own weight, Cottentex does a fast, thorough job of absorbing oils, grease or any liquid from metals, plastics or any type of composition. It is light in weight, economical, fast-acting and soft so as to protect parts while in the tumbling process. A free sample will be sent upon request.

Corrosion Resistant Tanks

American Agile Corp., Dept. MF, P.O. Box 168, Bedford, O.

Corrosion-resistant tanks, fabricated throughout from Agilide (unplasti-

cized polyvinyl chloride) are now offered by the above company.

These tanks are mainly of welded construction, entirely self-supporting and therefore offer resistance to corrosion on the interior as well as the exterior of the tank. Resistant to most mineral acids, alkalies, inorganic salts, and a large number of organic compounds at temperatures up to 170 deg., F., they are built to customer's specifications. Tanks are furnished complete with Agilide inlets and outlets and standard flanged fittings to permit incorporation into existing or new installations.

In addition to the outstanding corrosion-resistance, these tanks are extremely light in weight, and offer high structural strength.

For specific information on corrosion-resistance, and other particulars, write to the above company.

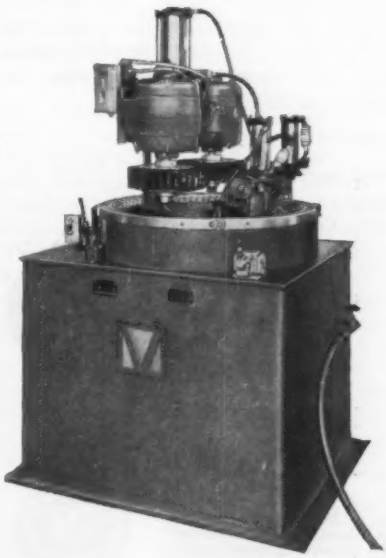
Automatic Deburring Machine

Grinding & Polishing Machinery Corp., Dept. MF, 2530 Winthrop Ave., Indianapolis 5, Ind.

A new turntable type deburring machine for rapid deburring of compressor stator rings, half rings or other number of ring sections of jet turbines, has been developed by the above firm.

Provision is made for holding ring sections to very accurate diameter during the deburring operation by interchangeable holding fixtures for different diameters of work pieces. Modifications of this design can be readily adapted for deburring other circular work pieces.

The experience of an aircraft engine company using the machine indicates a complete time cycle of one minute for loading, deburring and unloading a pair of 32" diameter aluminum half rings. Previous hand methods of deburring required an eight hour day for a set of 24 half rings. This machine does the job in 12 minutes.



Further information on the machine, named the TT-261, may be obtained by writing to the company.

BUSINESS ITEMS

Chandeysson Electric Appointments

The Chandeysson Electric Co., 4054-84 Bingham Ave., St. Louis 16, Mo., announces the appointment of the following officers: *A. Chandeysson*, vice-president, *D. Bundschuh*, treasurer and office manager, *William E. Schwarz*,

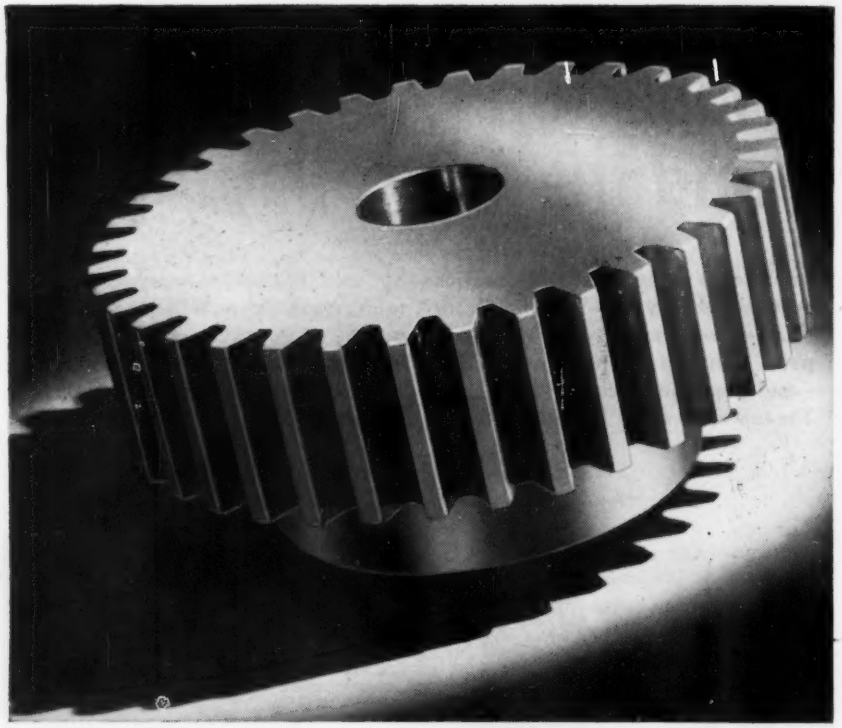
Tops for Quality and the top tells why!

Do we ever make a batch of Chromic Acid less than 99.7+% pure? Every so often we do. But when that happens, right out on the dump it goes —and good riddance.
The top label says "Extra High Quality" and that's what every drum contains. We think you'll like the uniform quality of our product and the way we make good on our promises. When you're in the market, why not call us?

99.7+% Pure
Consistently low in chlorides, sulphate and insolubles. More than meets every requirement of the electroplating industry, as well as U. S. Government Specification AN-A-21 and Federal Spec. OC-303.

PAINTS · PLASTICS · CHEMICALS · BFC

BETTER FINISHES & COATINGS, INC.
268 Doremus Avenue, Newark 5, N. J. • 122 East 7th St., Los Angeles 14, Calif.



High lustre finish... faster with

SUPER-HONITE CHIPS!

YES! New Super Honite gives a better finish —*faster*—than any other barrel finishing abrasive. That's because it's the world's *toughest* abrasive chip—engineered for grinding and burnishing to a high luster finish. Does it in jig time, too, because chips don't crumble or pulverize to slow the job.

So remember, for a better finish—in record time—specify Super Honite. No other chip cuts faster—no other chip cuts as long!

TOUGHEST NATURAL CHIP! Use Regular Honite for close tolerance work or minimum removal of metal. No other barrel finishing abrasive—not even granite—retains its edge as long as Regular Honite.

WRITE TODAY for your free copy of "3M Barrel Finishing" . . . it's filled with helpful information for increased efficiency, lower costs. Address Minnesota Mining & Mfg. Co., Dept. MF-43, St. Paul 6, Minnesota

Name.....

Company.....

Address.....

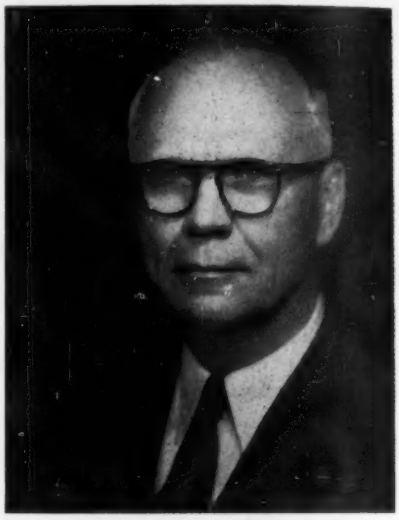
City.....Zone...State.....

Honite BRAND

Made in U.S.A. by Minnesota Mining & Mfg. Co., St. Paul 6, Minn.—also makers of "Scotch" Brand Pressure-sensitive Tapes, "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-slip Surfacing, "3M" Abrasives, "3M" Adhesives. General Export: 122 E. 42nd St., New York 17, N. Y. In Canada: London, Ont., Can.

William E. Schwarz

vice-president and engineering and plant manager, *Theo. A. Leonhardt*, vice-president and plant superintendent, *K. H. Eggers*, secretary. Mr.



Theo. A. Leonhardt

Schwarz recently rejoined the company, formerly being chief engineer. Mr. Leonhardt has been with the company for thirty years as supervisor of various plant departments.

Pennsalt Names Clem General Sales Manager

Albert H. Clem has been appointed general sales manager of the *Pennsylvania Salt Manufacturing Co.*, filling the position left vacant by the recent death of *Russell S. Roeller*, it was announced today by *William P. Drake*, vice-president.

Before this appointment, Mr. Clem was assistant general sales manager. He joined Pennsalt in 1938 following his graduation from the Pennsylvania State College with the degree of Bachelor of Science in Chemical Engineering.

Starting in the development department of the Research and Development Division, he was subsequently a technical sales representative in the Detroit area for the metal processing department; and then, in the same department in Philadelphia, a product

Albert H. Clem

supervisor, assistant sales manager, and sales manager.

He then became assistant to the vice-president in charge of sales; sales manager of the industrial chemicals department, and field sales manager in charge of all district sales offices. Mr. Clem served as a Lieutenant in the Navy Air Force during World War II.

George Schore Joins Gumm Chemical

George Schore

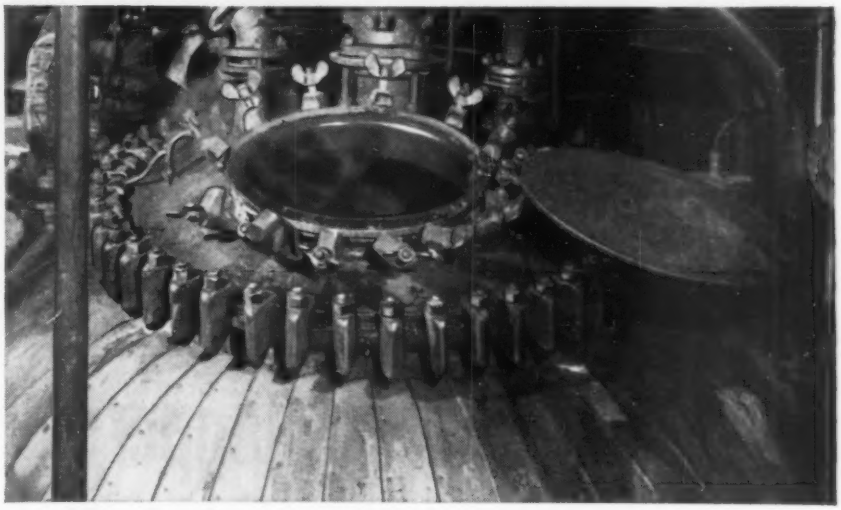
George Schore has recently joined the staff of the *Frederick Gumm Chemical Co.* of Kearny, N. J. as technical sales representaive.

Mr. Schore, who graduated from the

DOW

SARAN RUBBER LINED KETTLE RESISTS HOT HYDROCHLORIC ACID

Another example of how SARAN RUBBER TANK LINING helps cut cost of handling, storing or transporting corrosives



Here's a typical saran rubber tank lining application. This 2,000 gallon kettle, with baffle and agitator, handles hydrochloric acid and crystal slurry at 50° C. Lined with saran rubber over a year and a half ago, the kettle has given efficient and constant service since.

Saran rubber's high degree of chemical and abrasive resistance makes it the ideal lining for tank cars, storage tanks, tank trailers, processing tanks and other equipment handling corrosive acids, solvents, and other chemicals.

Saran rubber lining can be applied easily and economically by experienced saran rubber applicators located strategically throughout the country. We will be glad to advise you as to where and how saran rubber lining can be applied to your best advantage. Get in touch with your nearest SARAN LINED PIPE COMPANY office or write direct to The Saran Lined Pipe Company, 2415 Burdette Avenue, Ferndale, Michigan. Offices in New York Boston • Pittsburgh • Tulsa • Philadelphia • Chicago • Portland • Indianapolis San Francisco • Houston • Denver • Los Angeles • Seattle • Cleveland • Charleston, S. C. • Toronto • Montreal.

RELATED PRODUCTS

Saran rubber molded parts—stoppers, diaphragms, various-sized moldings for valves, instruments, etc.

Saran lined steel pipe—corrosion-resistant pipe that gives long-term operation with minimum maintenance costs.

Saran Lined Pipe Company
2415 Burdette Avenue, Ferndale, Michigan

Please send me your catalog on Saran Rubber Tank Lining and Saran Rubber Molding Stocks.

Name_____

Title_____

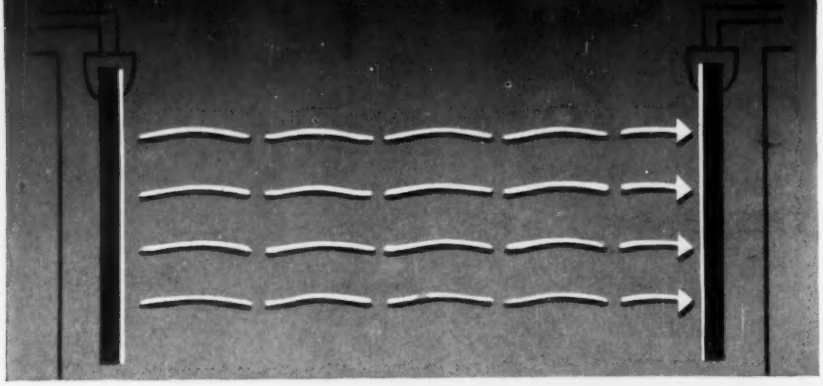
Company_____

Address_____

City_____ State_____

you can depend on DOW PLASTICS DOW

In Electroplating



...you'll want Koppers Potassium Cyanide Solution

• Koppers offers Potassium Cyanide in easy-to-handle liquid form. This time- and work-saving solution combines with copper cyanide, zinc cyanide, cadmium and silver cyanides to form a complex salt that is soluble in water.

Solid granules of Potassium Cyanide presently being used in the electroplating process require a dissolving period which, in turn, involves extra time and effort, and results in higher expenditures. Koppers economical, ready-to-use solution requires no preparation, whatsoever.

Potassium Cyanide is widely used in the copper plating of automobile parts, such as bumpers, door handles, and grilles, where copper is used as a base coat for chromium plating.

Koppers Potassium Cyanide is available in 55-gallon drums. Its lower price structure and its easy-to-use liquid form make it especially desirable. For further information, write:

KOPPERS®

Koppers Chemicals

KOPPERS COMPANY, INC.
Chemical Division, Dept.MF-43,
Pittsburgh 19, Pa.

College of the City of New York with a B.S. in Chemical Engineering, has been Superintendent of a number of large finishing plants in the Metropolitan area. For many years, he has been active in the American Electroplaters' Society and will be General Chairman of the convention to be held in New York in 1954.

His duties at Frederick Gumm Chemical will include the engineering and layout of plating, polishing and spraying plants and the sale of equipment and supplies.

Wagner Brothers Add Three New Sales Representatives in Eastern Michigan Territory

Larry Glynn

Wagner Brothers, Inc., manufacturers and distributors of plating supplies and equipment, have added three sales representatives to service their Eastern Michigan territory, which includes Detroit and Toledo, according to an announcement made today by *O. H. Tiedeman*, vice-president in

Henry Pfeuffer

charge of sales. The new men, *Larry Glynn*, *Henry Pfeuffer* and *Herb Marx* have had wide experience in production plating with leading plating firms in the territory they will service. Glynn and Pfeuffer have extensive chemical engineering and sales backgrounds. Marx has been in mechanical sales engineering.

Herb Marx

The new Wagner personnel will permit increased service to the growing Eastern Michigan territory. It is another step in the expansion and alteration of the present distribution and warehousing facilities of Wagner Brothers. The new men will locate at the home office, 400 Midland Ave., Detroit 3, Mich.

MacDermid, Inc. Announces Personnel Changes

A. R. McNeil

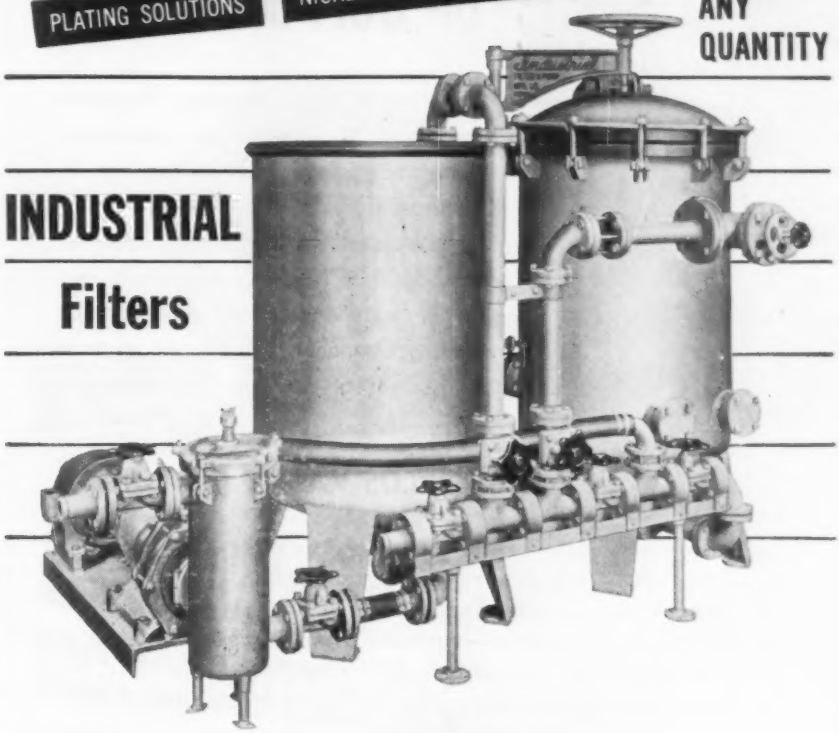
Harold Leever, vice-president of *MacDermid Inc.*, recently announced

CLARIFICATION of

PLATING SOLUTIONS · NICKEL DIP SOLUTIONS · NEUTRALIZER SOLUTIONS

ANY QUANTITY

INDUSTRIAL Filters



BONUS PERFORMANCE
with lasting reliability

The engineering and construction features of INDUSTRIAL filters add up to maximum clear filtrate with less floor space, greater operating conveniences, and less maintenance delays and expense. The general design permits the use of the materials best suited to the solution requirements. Vertical filter leaves with ample flow space on both sides offer maximum filtration area. Outside lockup simplifies the installation of filter leaf and bag assemblies. An exclusive air-wash cleaning method practically eliminates the usual labor and inconvenience of dismantling the filter after every cycle. INDUSTRIAL filters are often in operation for months without removing the cover — cutting downtime to a minimum. All these features have been proved in long-life service — your assurance of dependable bonus performance.

Full particulars and recommendations on any filtration job will be given upon request.

4381

INDUSTRIAL
FILTER & PUMP MFG. CO.
5906 Ogden Avenue, Chicago 50, Illinois

PRESSURE FILTERS
DEMINERALIZERS
RUBBER LININGS
CORROSION TEST CABINETS
HEAT EXCHANGERS

SAVE UP TO 40% OF BUFFING COSTS

You'll save labor because Nankervis compound applicators are completely automatic. Costly wheel tenders time is eliminated. You'll save on compound and buffs because just the right amount of compound is applied. And you'll cut down rejects with uniform application of buffing compound. It can add up to a savings of 40% of your buffing costs!

LOOK AT ALL THESE PLUS-VALUE FEATURES:

- **Easy to install — from any angle.**
- **Dirtproof — all moving parts enclosed.**
- **Lightweight — ideal for floating heads.**
- **Adjustable feed rate—variable from .0015 to .015 per strike.**
- **Accommodates cakes up to 24″ long.**
- **Operates on 110v single phase, 220 or 440v three phase.**

And, remember, automatic application of bar compound is cleaner, too.

SEND FOR BULLETIN M-13 TODAY.

GEORGE L. NANKERVIS COMPANY

metal-finishing equipment

19255 W. Davison Avenue • Detroit 23, Michigan

the appointment of *A. R. McNeil* as New England sales manager.

For the past nine years, Art has been Bridgeport sales service representative for the company. Mr. McNeil is active in the *American Electroplaters Society*, having held every office in the local branch.

Richard Nyquist of the sales laboratory has joined the field force as sales service representative. Mr. Nyquist is a graduate of Michigan State College and was in the sales laboratory in Waterbury for three years.

Allen Ferguson, former chief chemist of *Electrolux Corp.*, Old Greenwich, Conn., has joined the MacDermid sales service laboratory. Mr. Ferguson is a graduate of Baltimore City College and served in the Navy during World War II.

Fulton Joins Wyandotte

Harold F. Fulton recently joined the New York State staff of *Wyandotte Chemicals Corp.* He joins the staff of the Buffalo office and will service Empire State industrial customers, except in greater New York City, and in the Erie, Pa. area.

Mr. Fulton is a graduate of Miami University of Oxford, Ohio. His experience in the metal industries includes supervision of a heat treating and pickling department in a major steel mill, and six years of industrial sales and service work in Upper New York State.

Following thorough briefing in the company's Chemicals Research and Technical Service Laboratories, Mr.

Harold F. Fulton

Fulton was given field training on Wyandotte metal cleaners and related products in industrial plants in the Detroit and Cleveland area.

Lou R. Gallas Appointed by Electro-Glo

Lou R. Gallas

Lou R. Gallas has been appointed sales engineer for electropolishing processes and installations by *Electro-Glo Co.*, Chicago chemical manufacturer, according to the firm's president, *John Jumer*.

Gallas has been active in metal finishing industry affairs since 1941. He was formerly associated with *Promat Division of Poor & Co.* and Tincher Products Company Division of Ideal Industries.

His headquarters for the distribution of electropolishing concentrates will be located in Chicago.

Carborundum Appointments

Herbert P. Dales has been appointed

Carl L. Adelman

sales manager and *Carl L. Adelman*, assistant sales manager of the *Coated Products Division* of *The Carborundum Co.*, according to an announcement by *W. H. Wendel*, vice-president of the division.

Both Dales and Adelman have had

Herbert P. Dales

long experience in the coated abrasive field. Dales was for five years a coated abrasives sales engineer, then salesman, and finally assistant manager of the Chicago sales district prior to his recent promotion. Adelman started with Carborundum as a junior salesman in the New York sales district in 1930. He was transferred to the Buffalo sales district as an industrial salesman and for the past three years has sold coated abrasives exclusively. Their headquarters will be at Wheatfield, N. Y.

Fred W. Bonacker, general manager of *The Carborundum Co.'s Industrial Abrasive Sales Division*, has announced the following personnel changes in three district sales offices of the Company:

Russell P. Colosi, formerly office manager for the Cleveland office, has been appointed assistant to the Cleveland district sales manager. *Charles J. Walter* was transferred from the position of office manager of the Los Angeles district to office manager of the Cleveland district. *Wilfred Robson*, assistant office manager of the Chicago district was transferred to the position of office manager of the Los Angeles district sales office. *Joseph A. Marrone*, chief stock clerk at the Chicago office since 1949, was appointed assistant office manager of the Chicago district sales office.

Promotions at Titeflex, Inc.

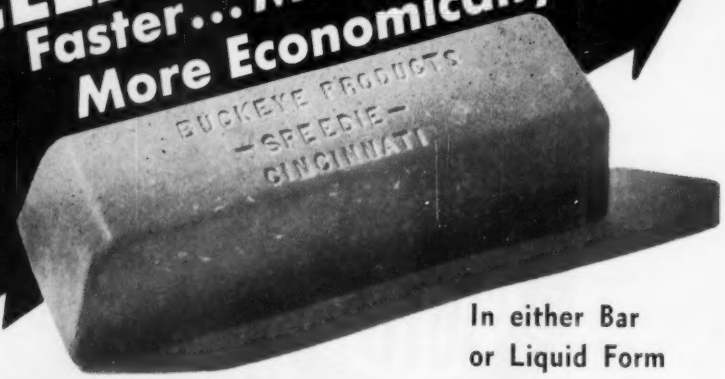
The board of directors of *Titeflex, Inc.*, Newark, N. J., announces the following promotions:

Henry S. Elder to executive vice-president. He has served as vice-president of Titeflex since joining the company in 1946.

George K. Licht to vice-president in charge of production at the company's two plants in Newark. He joined Titeflex in 1935 and was appointed works manager in 1948.

John J. Phillips to vice-president in charge of sales and engineering. He joined Titeflex in 1940 and became chief engineer in 1949. In his new position, he will consolidate and coordinate the company's sales activities with its engineering operations. Mr. Phillips is a member of the Society of Automotive Engineers.

CLEANS Faster... More Easily... More Economically!



In either Bar or Liquid Form

SPEEDIE Tripoli . . .

NOW . . .
SPEEDIE
"Spray It" Tripoli
No. 2072

Liquid—just spray it on. Water soluble. Stays in suspension. Will not clog lines or nozzle. Job-proved!

SPEEDIE Tripoli Compositions have long been known as "always-uniform" products which provide maximum cleaning efficiency with minimum time and labor!

For brass plumbing fixtures and die castings, the old reliable No. 607 can't be beat! No. 431 is 100% saponifiable — it cuts and colors beautifully.

No. 1074 is unmatched for name plates, emblems, and aluminum. For buffing all non-ferrous metals there is No. 1639 which *readily emulsifies in hot water*, eliminating cleaners.

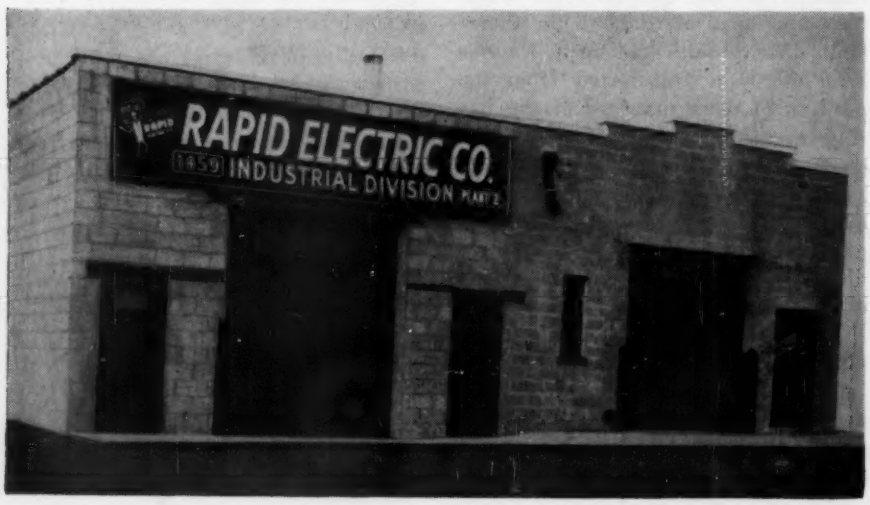
For further information on these quality, job-proved SPEEDIE Tripoli Compositions, and a free, handy Catalog-Reference Book for your polishing shop, write — on your company letterhead — today!

POLISHING ROOM SUPPLIES and EQUIPMENT

BP THE BUCKEYE PRODUCTS CO.
7033 Vine Street Cincinnati 16, Ohio
Cable address: Buckprod

Rapid Electric Adds New Plant

James Viola, president of the *Rapid Electric Co.*, has announced the addition of a new industrial plant which will be used exclusively for the manufacture of industrial type rectifiers and power transformers. In the ten years of its existence Rapid Electric has greatly increased its sales, and with the aid of this new plant will triple its production facilities.



Two Companies Join in Marketing Filtration Equipment

Edmund G. Smith

Adolph F. Leitner, executive vice-president, *Sintering Machinery Corp.*, Netcong, N. J., and *Edmund G. Smith*, president, *Equipment Development Co., Inc.*, Montclair, N. J., announce that an agreement has been concluded between the two companies for the development, manufacture and sale of a complete line of filtration equipment to be marketed under the trade name of "Edco-Sintering."

Under the agreement, the former company will manufacture and stock filtration units and parts, making available its extensive fabrication and machinery facilities at its Netcong, N. J. plant.

The latter company, operating under its numerous patents, will design, engineer and sell the "Edco-Sintering" line. Complete development and testing laboratories will be maintained.

Mr. Smith, co-founder of Equipment Development Co., and noted filtration consultant, has been actively engaged for over 27 years in development, design and manufacture of filtration equipment and synthetic fabric filter media. Mr. Smith is an active member of the New Jersey Section, A.I.Ch.E.

Tuthill Appoints Eastern Sales Engineer

Charles L. White has been appointed eastern sales engineer for *Tuthill Pump Co.* of Chicago, according to an an-

nouncement by *H. T. Kessler*, president of the company. With headquarters at 82 Hathaway Avenue, Elmont, Long Island, Mr. White will serve pump users in the territory east of Rochester in New York and Harrisburg in Pennsylvania.

Mr. White has a background of 25 years in sales, application engineering

Charles L. White

and maintenance in both light and heavy oil burning equipment. For many years, he represented a major oil company in the east.

Wyandotte Chemicals Adds to Service Staff

Kenneth W. Clayton, Thomas S. O'Donoghue and *Richard O. Watson* have recently been added to the Industrial Service staff of *Wyandotte Chemicals Corp. P. N. Burkard*, manager of the Industrial, Railroad and Aircraft Department, announces that Mr. Clayton will headquarter at Wyandotte's Los Angeles plant, Mr. O'Donoghue at the company's Chicago Office and Mr. Watson at Wyandotte's Detroit Office.

Clayton is a native Californian and has studied chemical engineering at Oklahoma A&M and at the University of California. He has plant experience in chemical processing and industrial painting. He more recently was associated with Fabricated Metals of Oakland and will bring Wyandotte Chemicals customers both sound laboratory and practical shop experience.

O'Donoghue received his technical training at Notre Dame, Northwestern and Loyola Universities, and had sales and merchandising experience with U. S. Rubber. He has received extensive technical training at Wyandotte Chemicals Technical Service Laboratory.

Watson is a graduate of the University of Detroit and was immediately employed as a process engineer by Wyandotte Chemicals Technical Service Department. For the past year, he has been in charge of one of the

Kenneth W. Clayton | Thomas S. O'Donoghue | Richard O. Watson

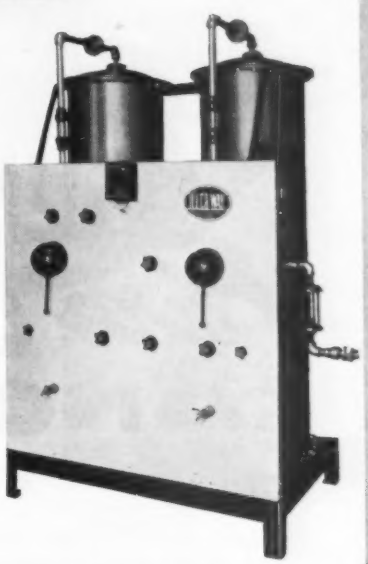
PURE WATER FOR PLATING AT A FRACTION OF FORMER COSTS

by ionXchange

Water that's solids-free is trouble-free

Records show that more and more fabricators and finishers are finding a short cut to a better product at *lower costs* by installing an ILLCO-WAY De-ionizer. . . . De-ionized water in rinsing or plating operations assures greater quality control and more operating economy. . . . Investigate also our new Chrome Purifier for recovery and purification of chromic acid anodizing or plating solutions. Write for literature.

ILLINOIS WATER TREATMENT CO.
856-4 Cedar St., Rockford, Illinois



MODEL LU standard (Package-type) unit for production of solids-free De-ionized Water. Units completely assembled and tested in factory . . . shipped completely assembled, requiring minimum installation.

ILLCO-WAY

Here are the basic tools for real craftsmanship in electroplating. Available in a full range of shapes and sizes, Hussey Pure Copper Anodes assure uniform finish and fast, dependable plating. For fastest service call the Hussey warehouse nearest you.

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ROLLING MILLS AND GENERAL OFFICES, PITTSBURGH 19, PA.
7 Convenient Warehouses to serve you promptly!

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NEW YORK.....140 Sixth Avenue
CINCINNATI.....424 Commercial Square
CHICAGO.....3900 N. Elston Avenue
ST. LOUIS.....1620 Delmar Boulevard
PHILADELPHIA.1632 Fairmount Avenue

company's technical service laboratories. He has specialized in metal finishing and processing and has considerable "trouble-shooting" experience in industrial plants in Michigan and Ohio.

Tank Lining Facilities at Stevens New Haven Plant

Complete new plant facilities for rubber or Koroseal lining all types of plating tanks have been installed in the New Haven, Conn. plant of *Frederic B. Stevens, Inc.*

The advantage of Stevens Koroseal linings are claimed to be longer wear, elimination of contamination and vulcanizing and unusually high corrosion resistance. With Stevens 'welding' process these linings bond permanently at approximately 100 pounds per square inch and linings may be applied to wood, steel, concrete or any other material commonly used for plating tanks.

Specially trained and experienced men have been added to the staff and the newest equipment and methods have been incorporated to assure this newest Stevens service to the ultimate in bonding, workmanship and service."

The new installation will be in a position to serve most of the northeastern states.

Appointments made by the Electric Products Co.

In line with their firm policy of developing engineering and production facilities to handle an expanding business, *Gordon J. Berry*, president of *The Electric Products Co.* has announced these new appointments:

Dr. W. A. Thomas has been appointed chief engineer and will be responsible for all electrical and mechanical design engineering, development and research. He was formerly manager of electrical engineering.

W. A. Thomas

E. D. Smith is now consulting engineer and will be responsible for assigned engineering projects requiring highly specialized investigation and development.

J. J. Unger becomes manager of electrical engineering and will be responsible for all electrical design activities.

J. R. Williams, formerly the central planning manager, has been appointed manufacturing manager and will be responsible for all production, production and inventory control and industrial engineering.

R. H. Worby has been appointed chief industrial engineer and will be

J. R. Williams

responsible for methods, tools, plant layout, materials handling, plant engineering and maintenance.

The Electric Products Company has been a manufacturer of special motors and generators since 1909.

Union Carbide Appointments

H. D. Hughes

H. D. Hughes has been appointed general sales manager and *E. E. Fogle*, sales manager, of the Industrial Chemicals Division, *Carbide and Carbon Chemicals Co.*, a Division of *Union Carbide and Carbon Corp.*, *W. F. Reich, Jr.*, vice-president has announced.

The announcement also marked the return to the company of Mr. Fogle who has been on a 7-month leave of absence as Director of the Rubber, Chemicals, Drugs, and Fuel Division of the Office of Price Stabilization.

Both Mr. Hughes and Mr. Fogle are veteran chemical salesmen, Mr. Hughes having joined the sales department of Carbide and Carbon Chemicals Company in 1928. For four years before that he was with a sister company in U.C.C., The Linde Air Products Company. In 1942 and 1943, Mr. Hughes was Director of the Commodities Bureau, War Production Board in Washington. He became Sales Manager of the Industrial Chemicals Division in 1945. In his new position, Mr. Hughes will co-ordinate the sales activities of the company's 21 district sales offices.

E. E. Fogle

Mr. Fogle joined the company through its research fellowship at Mellon Institute, Pittsburgh, in 1930. He became Cleveland district sales manager in 1940, Western Division sales manager in 1944, and assistant sales manager of the Industrial Chemicals Division in 1947.

Produces mirror-like deposits regardless of thickness ..... without scratch brushing or buffing.

the revolutionary Sel-Rex®

BRIGHT GOLD PROCESS

Hundreds of firms tested SEL-REX Bright Gold Process and all enthusiastically adopted it as their new gold plating standard. There are many reasons . . . here are a few:

- Excellent "throwing power" and metal distribution.
- Produces fine grain deposits, double the hardness of conventional gold.
- Eliminates the need for scratch brushing or buffing.
- Ideal for specification plating.
- Operates at room temperature.
- No complicated equipment required. Conventional racking may be used.
- Solution is stable and easily maintained.

Packaged in 1, 5 and 10 ounce bottles.

SAVE *time and money...* investigate the new Sel-Rex Bright Gold Process!

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229 Main Street • Belleville 9, N. J.

☐ Send trial order of 1-ounce of Sel-Rex Bright Cold Salts.

☐ Mail complete literature and prices.

☐ Mail information on SEL-REX Silver Sol-U-Salt, Gold and Rhodium.

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P. O. No. .....
Address .....
City ..... Zone ..... State .....

Richardson-Allen Studies European Methods

Wesley S. Block, Jr., president of the *Richardson-Allen Corp.*, and *C. E. Brigham*, vice-president, are on a five week trip abroad to study and analyze rectifier developments and advancements. Their tour will include Italy, Switzerland, France and England.

Technic, Inc. Acquires Robinson Solutions, Salts

Manufacture and sale of all precious metal plating solutions formerly made and sold by *A. Robinson & Son* of New York has been taken over by *Technic, Inc.* of Providence, R. I., according to *Frank K. Smith*, president of the latter company. Mr. Smith announces that Technic, Inc. has

GLOBE DIRECT DRIVE TILTING BARREL Controls Tumbling for . . .

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- FINER FINISH
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Available in Kiln-Dried Maple or Steel Shells

Globe tilting barrels save labor and time because they will take bigger loads and finish them faster. In many instances use of Globe Precision Barrels has eliminated costly hand operations. Globe's exclusive "work shifting" bottom gives complete agitation for uniform high-quality work.

Low speeds for non-ferrous and plastic parts assure quality finish without scratching or marring.

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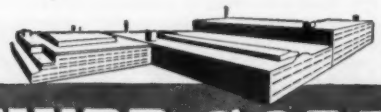
Hupp's experimental laboratory is at your service. Send samples of parts to be processed and finished part. Hupp will analyze your finishing needs and make cost-saving recommendations. No charge or obligation. Write Today.



HUPP CORPORATION

GLOBE STAMPING DIVISION

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SERVING INDUSTRY SINCE 1902

acquired sole rights to Robinson's "Assayed" Gold Plating Solutions and Salts, and henceforth will produce them exclusively in accordance with the high standards established by Technic for its own line of precious metal plating solutions.

The change-over, Mr. Smith says, will result in no interruption in service to former customers of A. Robinson & Son. Orders for Robinson's solutions and salts are being filled promptly by Technic. Already one of the largest enterprises of its kind in the world, Technic, Inc. has rounded out its line by the recent acquisition.

To solve plating problems submitted to Technic, Inc., the company maintains an engineering and analytical service, besides its well-known custom consulting and laboratory service.

Manufacturers' Literature

Booklet on Floor Safety

Industrial Sales Dept., Wyandotte Chemicals Corp., Dept. MF, Wyandotte, Mich.

A sixteen-page, illustrated booklet on floor absorbents and the maintenance of safe floors in industrial plants has recently been issued by the above company. Featured in the booklet are practical instructions and photographs of actual use of floor absorbents in several kinds of industries.

Copies of this Wyandotte Zorball booklet may be obtained without charge by writing the above company.

Liquid Buffing and Burnishing Compounds

Apothecaries Hall Co., Dept. MF, Waterbury 88, Conn.

The above concern has issued two bulletins, B-3 on liquid buffing compound, and B-4 on burnishing compound B. The former is an emulsion-type liquid binder, used for cutting down and coloring all metals and may be applied by spraying, dipping or brushing before buffing. Burnishing Compound B is a free-flowing, dry, mildly alkaline powder, soluble in water, used for burnishing aluminum parts.

Further information regarding these two bulletins may be obtained from the above company.

New Chemicals Booklet

Enequist Chemical Co., Inc., Dept. MF, 100 Varick Ave., Brooklyn 37, N. Y.

The above firm has issued a 48 page handbook on its industrial chemicals, plating processes and metal cleaning procedures. All the Enequist chemicals are listed and the booklet is designed as a guide for their processes.

Cleaning Compounds for Electroplating

Magnuson Products Corp., Dept. MF, 50 Court St., Brooklyn 2, N. Y.

The cleaning problems that confront the electroplating industry and suggested methods of treatment and solution of those problems are thoroughly and concisely covered in a new booklet.

The latest publication by the company on this subject in several years, the new booklet, handsome and easy to read with a comprehensive cross-index, delves into job definitions, job requirements and the considerations necessary in choosing the proper cleaning materials for the job at hand.

In addition, safety notes, operating practices and conversion factors and formulas enhance the value to all engaged in electroplating.

"Permag Cleaning Compounds for Electroplaters," as this new publication is titled, covers specifically such main fields as non-electrolytic cleaning, soap pre-soaks, electrolytic cleaning, barrel tumbling, aluminum processing and paint stripping. Listed also are a number of Permag compounds, many of which have been used suc-

cessfully for over a quarter of a century.

This booklet is in a handy pocket and index card file size and is available upon request from the above company, and its sales offices and representatives.

Inco Issues Literature

International Nickel Co., Inc., Dept. MF, 67 Wall St., New York 5, N. Y.

Electrodeposition of Hard Nickel. Illustrated with photo-micrographs, charts and tables, this 16-page article covers deposits of a hardness of 380 to 480 Vickers, in thickness and quality suited to industrial and engineering applications. Heavy deposits can be made, free from laminations, sound in structure and of a high order tensile strength (157,000 psi.) coupled with measurable ductility (6%). A nickel sulfate electrolyte containing ammonium salts and boric acid is used. High current efficiency, good throwing power and a high rate of deposition are attainable, and these advantages reduce the cost of heavy nickel deposits.

Electro-Forming and Deposition bring New Latitude to the Designer. 2 pages illustrated. Describes two developments in the plating field that widen the scope of the designer. Heavy, uniform nickel coatings can be deposited on plastics, giving them a metal surface while preserving their light weight. Nickel may be the finish coat or may be used as a base for chromium or precious metals. Simple and complicated shapes can also be electroformed, on permanent or destructable mandrels, within tolerances of 2/10,000 inch. There is little limitation to the complexity of the shapes that may be produced. Rounds, squares, recesses, undercuts and other variations can be combined in a single design. 40,000 finished pieces a week have been fabricated by electroforming.

Plastisols Described

Houghton Laboratories, Inc., Dept. MF, 322 Bush St., Olean, N. Y.

An extensive group of plastisols, designated the Hysol 3,000 Series, is described in a new four-page bulletin. These plastisols are dispersions of high molecular weight polyvinyl chloride resins in selected liquid plasticizers. Available in a variety of different forms, they are said by the manufacturer to offer improved corrosion protection, abrasion resistance and electrical insulation.

Among the plastisols considered in the brochure are types for: electrical insulation; rack, tank and duct coating in electroplating applications; casting doll components and toys; flexible molds; spring coatings; conveyor rack coatings; wire basket coatings; and caulking and sealing.

In addition to descriptive material, the bulletin includes illustrations of various applications; specifications; formulation procedure and application techniques, including dipping, spreading and casting methods.

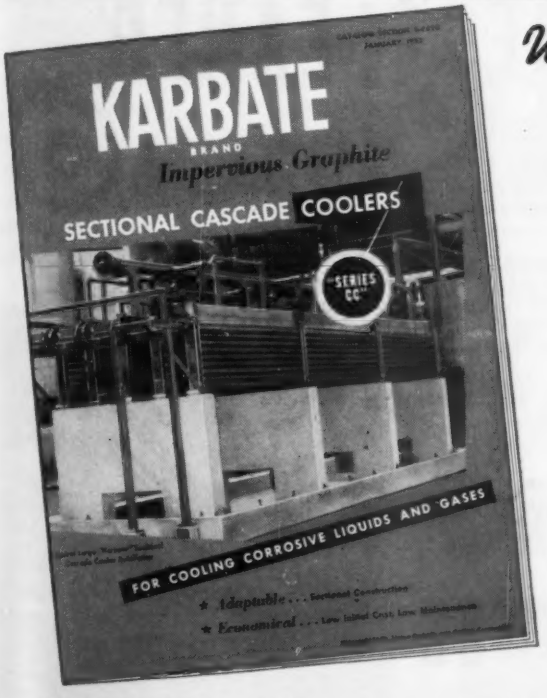
Electro-Cupralum Anodes

Knapp Mills, Inc., Dept. MF, 23-15 Borden Ave., Long Island City, N. Y.

A reprint is available from the above company on Electro-Cupralum anodes. This illustrated booklet covers developments and improvements in chromium plating processes and procedures.

Further information may be obtained by writing to the above address.

ANOTHER TOP VALUE FOR THE METAL FINISHING INDUSTRY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BRAND
Impervious Graphite
SECTIONAL CASCADE COOLERS
"SERIES CC"
FOR COOLING CORROSIVE LIQUIDS AND GASES
★ Adaptable . . . Sectional Construction
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National Carbon's *NEW* "KARBATE" Sectional Cascade Coolers

- High Heat Transfer Rate
- Low Initial Cost
- High Cooling Water Capacity
- Type SN Armored Connections
- Radiused Returns for Low Pressure Drop
- Redwood Water Guide Strips
- "Teflon" Gaskets
- *Three* Standard Models Available from Stock

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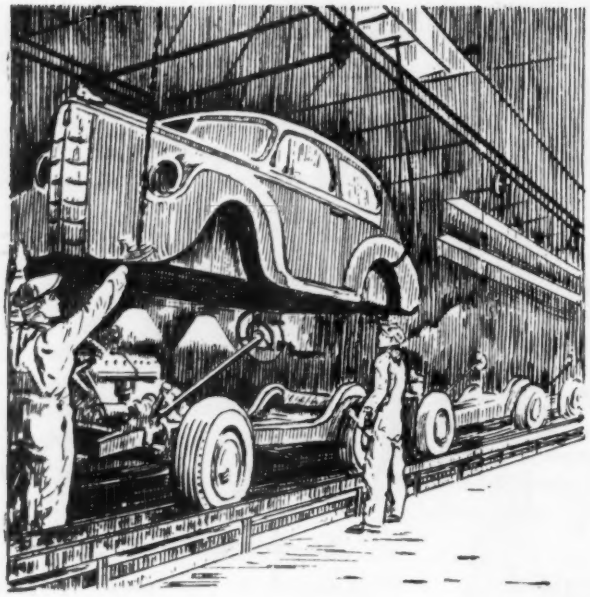

MOTOR CITY PLATING NEWS

The Plating Institute of Michigan Elects new Officers and Directors

At their annual meeting held on Tuesday, February 10, 1953, *The Plating Institute of Michigan* elected officers and directors for the year 1953-54. *Glenn H. Friedt, Jr.* of United Platers, Inc. was elected president; *Howard E. Morse, Jr.* of Northeastern Plating Co. was elected vice-president; *William Savin* of Harding Mfg. Co., Inc., was elected treasurer; and *James D. Mueller* was reappointed executive secretary. Elected to the board of directors in addition to the above officers were *Hugh Barron* of Industrial Stamping Division of Vinco Corp., *Louis S. Morse, Jr.* of Detroit Plating Industries and *Gerald Burgess* of Electroplating Service, Inc.

The Plating Institute of Michigan is

NEW CATHANODE CLEANER

YOUR ATTENTION is invited to a new cleaner recently developed by Pillsbury. While no literature is as yet available, a Pillsbury specialist will gladly call on you and give you the surprising facts. Full protection of Cathanode Cleaner is under way.

- **WHAT IT IS**—Cathanode, another Pillsbury first, is a heavy duty electrolytic cleaner for reverse current cleaning of steel.
- **PILLSBURY CATHANODE** has high conductivity at 8 oz. per gallon. It will rapidly clean all types of soil — drawing compounds, oils or greases — or removes pickle smut in seconds.
- **EASY TO USE,** and safe, Cathanode rinses quickly and completely . . . will not spray or explode.

ANOTHER CLEANING FIRST FOR THE METAL FINISHING INDUSTRY BY

PILLSBURY CHEMICALS

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Complete line of precision controlled preplating cleaners, rustproofings, and stamping compounds.

a trade association composed of job platers from the greater Detroit area. The Institute was founded in 1938. Its members now do about 75% of the job or production electroplating in the area.

Detrex Elects Officers

P. H. Richey

Detrex Corporation of Detroit, pioneer manufacturer of industrial equipment and chemicals, has announced the election of *P. H. Richey* as assistant treasurer and *F. J. Chmielnicki* as assistant secretary.

After graduating from the University of Michigan, Mr. Richey was associated with the Detroit Bank before joining Detrex in 1948. Advancing through various positions in the Controller's office, he was appointed personnel director in 1950. Subsequently, he was assigned to special duties in the office of *E. W. Allison*, treasurer. Mr.

F. J. Chmielnicki

BETTER COMPOUNDS *mean* MORE PRODUCTION *and* INCREASED PROFITS

Thirty years of experience developing and furnishing Polishing and Buffing Compounds to the Automobile Industry and hundreds of allied metal working firms entitles us to solicit the opportunity of working on your polishing and buffing problems.

WRITE US TODAY

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use **Electro-Glo** ELECTRO-POLISHING CONCENTRATES

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SMOOTHS . . . BRIGHTENS . . . DEBURRS

Removal of metal can be controlled down to .0002 of an inch.

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AUSTENITIC STAINLESS STEEL	ELECTRO-GLO #300
MARTENSITIC STAINLESS STEEL	ELECTRO-GLO #400
CARBON STEEL	FERRO-GLO #500

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EXPANDED PLANT and PRODUCTION speed deliveries of HAVEG

• The huge expansion of the chemical industries gave Haveg an order backlog that resulted in long deliveries and forced some of our customers to seek substitutes or to use less satisfactory materials.

Actually there is no substitute for Haveg equipment with its superior resistance to corrosives. Haveg can be easily repaired. It can be machined and resurfaced. It can be altered in the field. When it comes to long service life and a minimum of maintenance Haveg has a proven record.

Now the Haveg Corporation has good news to report. New equipment and a drastic streamlining of manufacturing techniques have practically doubled plant capacity. From our Marshallton, Delaware factory you can get deliveries as listed at the right.

PIPE AND PIPE FITTINGS

From stock up to two weeks

FUME DUCT

Two to four weeks

LARGE CYLINDRICAL TANKS AND TOWERS

Two to four weeks

RECTANGULAR TANKS AND TOWERS

Four to eight weeks

JETS, VALVES, BIFURCATORS

Two to ten weeks

CALL YOUR HAVEG SALES ENGINEER FOR TECHNICAL ASSISTANCE

When you need advice, help and emergency supplies of amazing Haveg cement, call your nearest district office. A Haveg sales engineer knows how to help you fight corrosion all the way. Ask to see his photo book showing the wide variety of Haveg molds and the machining possibilities of the material. WRITE TODAY for 64-page technical bulletin F-6. It gives complete information about Haveg, the material and the company that can help you solve your corrosion problems.

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3230 Peachtree Rd., N. E. Exchange 3821	1201 Palmolive Bldg. Delaware 7-6088	7617 Reading Road Valley 1610	16104 Kinsman Road Washington 1-8700
DETROIT 35	**HARTFORD 5**	**HOUSTON 4**	**LOS ANGELES 14**
19951 James Couzens Hwy. Broadway 3-0880	86 Farmington Ave. Hartford 6-4250	4101 San Jacinto Jackson 6840	523 West Sixth St. Mutual 1105
SEATTLE 7		**ST. LOUIS 17**	
5600-14th Ave., N.W. Hemlock 1351		2683 Big Bend Blvd. Hiland 1223	

Richey served in the U. S. Army during World War II for four and a half years in various staff capacities relative to personnel and finance.

Mr. Chmielnicki has been with the company for 11 years as counsel and as head of the Detrex legal department. Graduate of the University of Detroit, he is a member of the Detroit and Michigan Bar Associations. He is on the executive committee of the Michigan Section of the American Industrial Hygiene Association, and a member of the Michigan Patent Law Association.

He was a captain in the Adjutant-General Division of the Army for three and a half years during the War.

Detroit Branch

President *H. E. Head* called the meeting to order on Friday, February 6th, at 8:15 P.M. in the Hotel Statler Michigan Room with approximately 140 members and guests present. A special guest, *J. E. Fritts*, Ternstedt Division, GMC, Columbus, Ohio, was introduced. Mr. Fritts is a Past President of the Detroit Branch. Mr. Head announced that *Frank Clifton* was unable to attend the meeting because of illness.

Mr. Head reported that an old timer, *Charlie Eldridge*, passed away on October 10, 1952, and gave a brief summary of Eldridge's life in the plating industry. He also announced that the placement service as covered by the By-Laws is handled by the Secretary-Treasurer. Anyone desiring the assistance of this service should contact the Secretary-Treasurer by letter.

Joe Gurski, Secretary-Treasurer, reported that there were two applications for membership. These two people were unanimously elected into the branch.

Membership Committee—Chairman *Les Borchert* said membership at present is above the 500 mark and that everyone should consider themselves a part of the committee to keep membership at its present high level.

December Party Committee—Chairman *Howard McAleer* reported that the final summary report of the party has not yet been completed but should be ready shortly.

Ladies Night Committee—Chairman *Cleve Nixon* read the list of nominees

for Branch Offices which were selected and approved by the committee. Nixon announced that Mr. Head was not renominated for President at his own request. Mr. Head thanked the committee for their work after Nixon's report and dissolved the committee.

It was announced that according to the Branch By-Laws, nominations for office should be accepted from the floor. In order to avoid taking up time on Ladies Night which is scheduled for the March meeting, the membership was asked to submit nominations in addition to those selected by the nominating committee either by mail or personal contact with the President or Secretary-Treasurer at any time up to the March meeting.

Head also announced that a report on the Interim Meeting in Columbus, Ohio, was to be made at the next meeting.

Gene Jarvis substituted for Educational Chairman *Fred Olmstead*, who was called away unexpectedly. After the showing of a colored movie, "Unfinished Rainbows" which depicted the history of the *Aluminum Company of America*, Mr. Jarvis introduced *R. L. Davidson*, Vice-President of the *Grva-i-Flow Corp.*, the principal speaker.

E. J. Kubis,
Publicity Chairman

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CUTTING *and* TUMBLING BARRELS

for better work in less time!

For uniform cutting down, wet or dry grinding, tumbling, pulverizing and mixing, the unique design of Hartford Triple Action Barrels saves time and money and produces better results. Hartford Barrels give a TRIPLE ACTION in tumbling the material, an "over and over, end to end, folding-in" motion combined, which quickly grinds off burrs, and finishes and smooths the general surface of any article in the load. These barrels are available in two sizes, large and small, and with both motor and belt drive. Hartford also makes steel burnishing balls scientifically correct in design and material for each specific job. Bulletin on request.

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Du-Lite gave this part with its complicated knurls, slots, threads, etc. a fine rust-resistant durable black finish. It is typical of many other parts, small and large, which have been black oxidized by Du-Lite for many years. Moreover, Du-Lite meets most individual and government specifications including 57-0-2C for Type III Black Oxide finish.

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METAL FINISHING SPECIALISTS

News from California

By Fred A. Herr

Effective March 1, *A. J. Lynch Co.* was appointed California distributor for the *Hanson-Van Winkle-Munning Co.* of Matawan, N. J., handling distribution of the plating equipment and supply line through its Los Angeles and San Francisco branches.

B. W. "Dempsey" DuToid of the *Arthur Supply Company*, Los Angeles, recently spent several weeks in the East checking up on what new developments and techniques in buffing have been taking place. He inspected plants in Connecticut, New York and New Jersey, and also availed himself of the opportunity, while in New Jersey, for a call at the home office of *Finishing Publications, Inc.*, in Westwood, for a talk with *Thomas A.* and *John E. Trumbour*.

Mr. DuToid said he was chiefly impressed by the great extent to which automatic buffing has spread in the East, particularly on small parts. While hand buffing on small parts is still the order of the day, in the main, on the Pacific Coast, Mr. DuToid said he found that such items are generally automatically buffed in the East.

Raymond Rauen, 52, vice-president and general manager of the U. S. Spring & Bumper Company, Los Angeles, was fatally injured when thrown from a car in which he was a passenger on the Pasadena Freeway on February 3. U. S. Spring & Bumper operates one of the largest plating plants on the west coast for auto bumper finishing, with *Alex Regmunt* as plating superintendent.

Retirement has palled on *Earl Coffin*, former owner of the *Palace Plating Works*, Los Angeles, and on March 1 he joined the service and sales staff of *L'Hommedieu & Sons Co.*, Los Angeles Branch. Earl sold the Palace plant some two years ago after 25 years of successful operation as a general job shop.

Gene Bedwell and *Herb Corum* have sold their interests in the Bedwell & Corum plating job shop at 2545 Denby Ave., Los Angeles, to *Anthony Shullo*. For the time being, Bedwell continues to work under the new owner. Bedwell and Corum rank among the veteran platers of Southern California. Both worked for *Don Bedwell* (Gene's brother) when Don started the Deluxe Plating Company at 31st and S. Main Sts., Los Angeles, in 1921, shortly after Don's discharge from service in World War I with the 12th Infantry of the Eighth Division. Few of the rising generation of platers probably know it, but Don was one of the legging-wrapped troopers who help Black Jack Pershing chase Villa across the Mexican Border in the pre-World War I days.

Fred Weiss, vice-president of *New England Lead Burning Co.*, Whittier, Calif., a branch of the Boston firm, and Mrs. Weiss spent a month's vacation in Honolulu during February and March.

Farnsworth Currier, president of the *Currier Co.*, Oakland, Calif., producers

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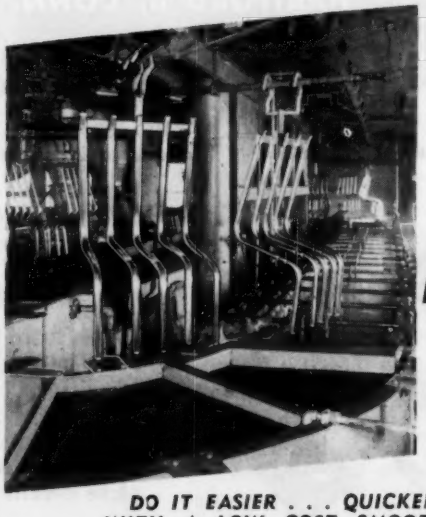

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and distributors of product finishing equipment and supplies, has announced appointment of *Robert W. Jeffery* as general sales manager, with headquarters at the Oakland main office. Mr. Jeffery is a registered engineer and former manager of infra-red sales for the *Fostoria Pressed Steel Corp.*, Fostoria, O. He brings to the Currier organization a wide background of experience with and knowledge of industrial finishing.

Freiden Calculating Machine Co. is nearing completion on a new 60 x 100 finishing shop at his main factory in San Leandro, Calif. The shop has been equipped with complete anodizing, magnesium treatment, plating and stainless steel chemical processing facilities. The installation contract, complete with steam and water systems, was handled by *L'Hommedieu & Sons Co.*, West Coast branch. *Fred Shear* is general plating superintendent for the Freiden plant.

Also under construction at San Leandro adjacent to the calculating machine factory is a 250 x 400 foot building intended for assembly line purposes for defense items.

Kenneth P. Ballinger, vice-president of the *Chemical Corp.*, Springfield, Mass., was in Southern California on a business trip in March. He conferred with *Jack Bealle*, *Tom Turner* and *Hal Wells* of *Crown Chemical & Engineering Co.* of Los Angeles, which firm serves as West Coast distributor for Chemical Corporation's Lustron and resin bonded Pla-Tank products. Ballinger caught a plane out of Los Angeles on the night of March 11th, immediately after completing a talk on conversion coatings for zinc before Los Angeles A.E.S. Branch.

Douglas Simpson has been promoted from plating department foreman to factory superintendent of the Cal-Nevar Co., Los Angeles. The firm specializes in the manufacture and finishing of automobile accessories. It operates a fully automatic plating and polishing division with 70 full time employees.

The most modern facilities for plating, polishing, metal bending, wood fabrication and upholstering will be included in the new $1,750,000 plant of the Certified Chrome Furniture Co., Inc., on which construction began in El Segundo, Calif., in February. Plans call for a 90,000 square foot building.

Miller Dial & Nameplate Co. has started construction on a new factory and office building at El Monte, Calif., for production of metal, plastic and phenolic dials and name plates. Removal of equipment from 781 East Washington Blvd., Los Angeles, to the new plant is expected to be undertaken in June. Application of radium to the surfaces of dial numerals is one of the firm's operations.

A steel painting and stripping building 70 x 300 feet in area is included in a program of plant expansion now underway by Northrop Aircraft, Inc., at Ontario, Calif. The painting and stripping unit is part of an expansion of 60,000 square feet of floor area at Ontario for added facilities for work on Scorpion F-89 interceptor planes.

Philip S. Fogg, president of *Consolidated Engineering Corp.*, Pasadena, Calif., reports the acquisition by his firm of the vacuum equipment department of Eastman Kodak Co., *Dis-*

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because they're job-fitted

On a broach rotor core operation, handling wet broach with coolant that carried sharp slivers, this No. 934 Redmont glove wore 5 times longer than the best glove previously tested, *because it was designed for the condition:*

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Made snag-proof by bonding to strong fabric base

Improved non-slip grip

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Wing thumb with extra wide span, curved fingers

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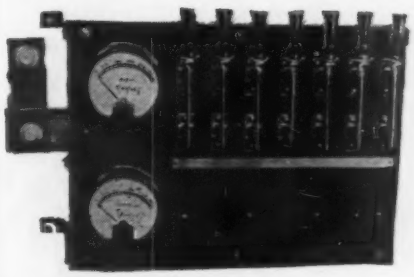

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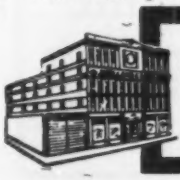

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tillation Products Industries at Rochester, N. Y. *Consolidated Vacuum Corp.* has been formed as a wholly owned subsidiary of Consolidated Engineering, and will operate from plant and offices to be acquired in Rochester.

Norman R. Ekholm, Bellevue, Wash., abrasive sales engineer in Washington, Idaho and Montana, has been named abrasive engineer to cover the northern California, southern Oregon and western Nevada district for *Norton Co.* of Worcester, Mass. Ekholm succeeded *Edward G. Petherick* of Los Altos, Calif., who represented Norton in the area for 25 years.

OBITUARY

JOHN WARD ENGLISH

John Ward English, of Ansonia, Conn., and salesman for the Wyandotte Chemical Co. since 1919, died on March 9. He covered New England for Wyandotte and was one of the best informed and most respected of its Sales and Service Supervisors.

John Ward English

Mr. English was a member of the American Electroplaters' Society, past president of the Board of Education, a member of the Holy Name Society of the Church of the Assumption, and the Derby Lodge of Elks.

He leaves a daughter, Mrs. John Glenn of Ansonia, and a brother, Edward English, also of Ansonia, and two grandsons.

Associations and Societies

MASTERS' ELECTROPLATING ASSOCIATION

Due to the overwhelming demand for reservations, the Association has changed the date and location of its annual banquet. It will now be held on May 9, instead of April 11, at the Starlight Roof of the Waldorf-Astoria Hotel, New York City.

AMERICAN ELECTROPLATERS' SOCIETY

Pittsburgh Branch

The Pittsburgh Branch of the A.E.S. held its regular monthly meeting on February 12, at the Sheraton Hotel. Officers present were *Art Kaupe, Rex Goldbach, Bob Varner, Rudy Schindler, Damon Antel, G. S. Woodruff, E. J. Smith.* Twenty-two members were present for the dinner and forty-five attended the main lecture.

COLUMBIA

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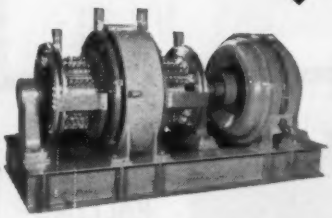

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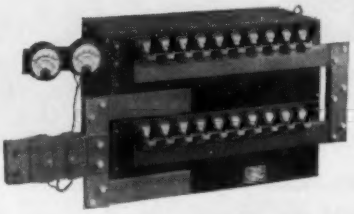

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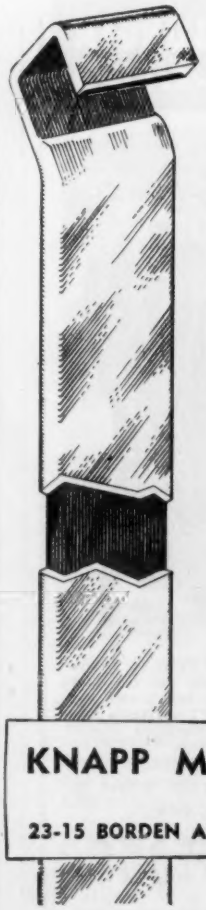

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A NEW AND REVOLUTIONARY DEVELOPMENT

Electro-Cupralum Anodes are manufactured by combining copper and lead through a Homogeneous Extrusion Process whereby the two metals are chemically and inseparably bonded together.

The resultant product consists of a full width *continuous* copper electrode with a Homogeneous lead covering on all sides except the underside of the copper hook.

FEATURES

1. Ten times the electrical conductivity of any Lead Anode.
2. Faster, better plating.
3. Even distribution of current through solution.
4. Permanently rigid.
5. Tenacious, insoluble coatings.
6. No build-up of temperature.
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Electro-Cupralum Anodes are *superior* because they combine the *superior* conductivity of copper with the *superior* protection of lead.

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Our president asked the committee heads to report any news.

Bill Wilson, chairman of the Ladies Nite committee, reported that the banquet plans have reached the finishing stage and that it appears that Saturday night, May 2, at the Sheraton Hotel, should be a highly entertaining evening. Treasurer, Damon Antel, reported the financial status of the Branch.

The membership committee was most happy to present eight new applications for membership. It is indeed gratifying that we are able to inject new blood into our organization in such quantities. A majority of the new applications are affiliated with Westinghouse Electric and we feel that more companies both large and small should take advantage of the educational benefits which the Society has to offer. The new applicants are: *Eli Shay*, Wean Engineering; *Loren W. McOmber*, E. I. DuPont; *James W. Condon, David Martin Roney, Jr., Wenzel L. Bohman, Robert E. Harrover, Jr., James Robert Crain, Joseph R. Kristofik*, all of Westinghouse.

Ed Smith, of the nominating committee, made the following nominations for officers of the year 1953-54: President, *Ed Washburn;* first vice-president, *Bob Varner*, second vice-president, *G. S. Woodruff;* secretary, *Bill Wilson;* treasurer, *Irwin Schram;* librarian, *Myron Ceresa.* Delegates: *Rex Goldbach, R. Woofter, Ed Washburn.* Alternate Delegates: *Leslie Lancy, Lee Schmitt, Myron Ceresa.*

Our librarian then introduced the speaker of the evening, *R. O. Hull* of the R. O. Hull Co., Cleveland, O. Mr. Hull is no stranger to most members and those who do not know him personally are, of course, familiar with the many contributions he has made to the plating industry. Mr. Hull related a short history of the bright zinc plating field and elaborated further on various functions of brightness. By the use of slides, he showed a diversity of situations encountered in bright zinc plating. The fact was brought out that a rectifier current source might possibly cause plating difficulties which are too often blamed on solution faults. The subject of current difficulties presented a rather unusual topic of discussion. It is certain that many present picked up valuable information from Mr. Hull's discourse. The lively question period was very indicative of the receptive manner by which the members approved the lecture.

R. H. Schindler
Secretary

Milwaukee Branch

Milwaukee Branch A.E.S. Annual Educational Meeting and Banquet to be held Saturday, April 25th, 1953.

It has always been Milwaukee's aim present a program that is different from any other, this has been proven in the past. Now once again Milwaukee has succeeded in having something unique.

The theme will be "Plating, not now, but in 1955, 1960, and 1965." To present these interesting papers, will be:

Dr. R. B. Saltonstall, Udylite Corporation.

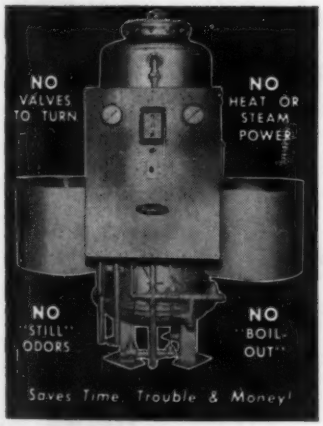
R. Scott Modjeska, Scientific Control Laboratories.

Dr. Abner Brenner, National Bureau of Standards.

Dr. Saltonstall will speak on plating of common metals in aqueous solutions.

Mr. Modjeska will have as his sub-

CHEMICALLY PURE
WATER
For Plating Solutions & Hot Water Rinses



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The new Penfield Mono-Column Demineralizer pictured above performs all its operating functions automatically — even accomplishes complete regeneration, including automatically recutting in effluent, with one turn of a switch. Write for full information on units of any desired capacity from 10 to 10,000 gph.

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Penfield Demineralizers are shipped ready-to-operate. Standard equipment includes MONEL METAL regeneration tanks and all necessary gauges, flow meter, conductivity meter, etc. Simply connect the completely "packaged" unit to service lines and start operation.

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FILTERS · SOFTENERS · DEGASIFIERS · DEMINERALIZERS
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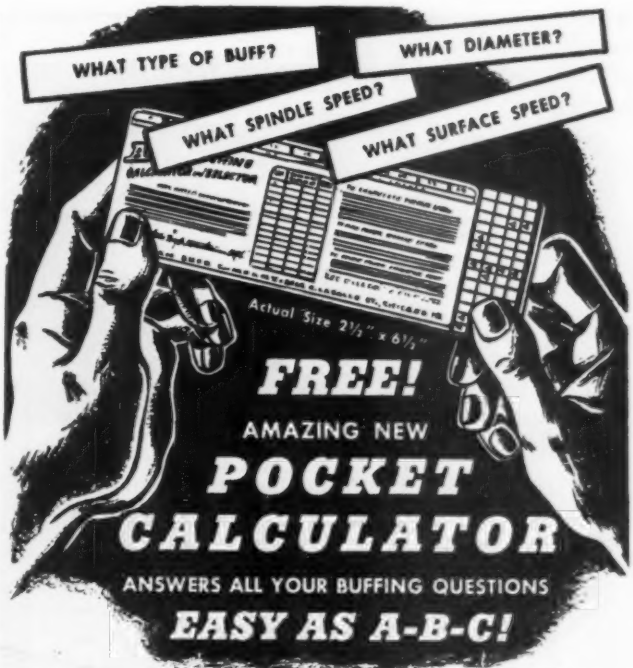

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ject, electrodeposition of less common metals from aqueous solutions.

The topic of Dr. Brenner's paper will be, electrodeposition of uncommon metals from aqueous solutions in the future.

As in the past there will again be a speakers luncheon. However, we will be honored with the presence of *Clyde Kelly*, 3rd Vice-President of the National Society. Mr. Kelly will discuss American Electroplaters' Society in future problems of electroplating.

Not only are the papers different, but everyone is invited to visit the new plating plant of *Cutler-Hammer, Inc.*, and also Cutler-Hammers' new organic finishing plant. These visitations will be held in the morning from 9:00 A.M. to noon.

The evening fun will start at 7:00 P.M., and as usual, we will attempt to make it the best of the year.

Indianapolis Branch

On March 4, 1953 the regular meeting of the Indianapolis Branch was held with a dinner at 6:30 P.M. at the Fox Steak House. Thirty-three members and guests attended and, for the program at 8:00 P.M., the group numbered forty-one. Guests included *Thomas O'Brien*, Chicago Branch, *Mr. Emmerich*, Detroit Branch and *Harold Faint* of Chicago Branch, who was the speaker of the evening. Mr. Faint's subject was "The Use of De-mineralized Water in the Plating Industry." The process was fully explained and reasons given proved that de-mineralized water is certainly necessary in many localities for plating solutions. The group asked many questions of Mr. Faint and he very ably answered them.

The business meeting followed the program and the first item was the reading of the minutes of February meeting and their approval. The treasurer once again reminded us that the dues are due. Two new members were approved and voted into the Society in a motion by *Harry Smith* and seconded by *Les Reynolds*. These new members were both of Arvin Industries. *Loren D. Stevens*, 515½-7th Street, Columbus, Ind. and *John Cornpropst*, R. No. 5, Coulmbus, Ind.

Herb Kennedy reminded us of the Cincinnati Educational Session & Dinner-Dance of March 28th. He has tickets if anyone desires them. *Don Patrick*, president, reminded the group to send in the questionnaire to "Plating" which we all received three months ago. Mr. Patrick read a letter from *Franklin MacStoker*, Supreme Society President which announced the change in policy in "Plating."

The committees for the annual affair reported all were progressing well and everything is shaping up to a fine session and dance.

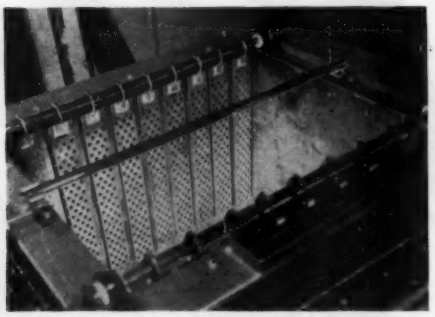
Our president appointed the following as delegates to the convention:

Edna Rohrabaugh, John Holland, John Hood.

These were appointed as alternates: *Dr. Abraham Max, Bert Hawhee, Chester Weekly.*

In view of the fact that the increase in dues went into effect after our fiscal year began, *Dr. Max* made a motion that dues for present fiscal year members be billed at $8.00 and any deficit incurred by the per capita tax of $1.00 per member be made up by the treasury. *Harry Smith* seconded the motion and it was passed. The May meeting will be held in Columbus as usual and plans are going ahead

Anodes that rate higher



HIGHER in utility and higher in economy — STORTS Perforated Anodes prove out in actual service — perforated steel anodes for electro-alkali cleaning and perforated lead anodes for electro-acid stripping — designed for heavy duty and long life — made in any lengths to suit your needs.

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Manufacturers of Welded Fabrications to Specification

FILTER 50-1500 GAL/HR ANY ELECTROPLATING SOLUTION

NO ROUGH DEPOSITS
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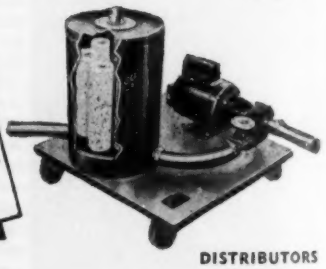
Model ASI-600
Cap. 850 gal/hr
Sethrin Resin Filter Assembly
Portable, Wt. 150 lb.
2'x2'x2'



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for it. The meeting adjourned at 9:40 P.M.

Respectfully submitted,
Edna Rohrabaugh,
Secretary

Cincinnati Branch

The February 25th meeting of the Cincinnati Branch was held at the Engineering Society Headquarters with President *Robert D. Miller* in the chair. Mr. Miller mentioned for the Branch's information:

1. Letter from Vice-President *Ralph Schaefer* on the change in publication of the Annual Proceedings and the bound copies of *Plating*.
2. The annual meeting of The Technical Societies of Cincinnati on February 27, 1953.
3. Letter on Branch Exhibits at the Philadelphia convention. No action taken.
4. Advised that the election of officers would be held in April rather than March due to the fact that we would have no meeting next month since the Educational Session and Dinner-Dance would be held then.

The Secretary presented the application of *John Edward Hoover* of the Ford Motor Co. which was accepted. He also presented the transfer of *Arthur J. Gerada* from Detroit, and asked members to be sure to answer the questionnaire on Plating.

Dick Evans reported on the picnic, stating that the committee felt that Devou Park, Covington would be the most suitable location. It was decided to hold this event on June 6th with June 27th as second choice.

Charles Wise advised that reservations were coming in for the Dinner Dance, asked for additional company contributions, and requested a good turnout at the Educational Session on March 28th.

Mr. Miller introduced *Joseph Gurski* of the Ford Motor Co.'s Rouge plant. Discussing "Plating Applications on Automotive Parts," Mr. Gurski told of his work in Ford's Materials and Processing Department, their selection of coatings, methods of testing and various factors affecting the quality of plated finishes, particularly on die castings.

J. C. Miller Co., were hosts for the social hour which concluded the meeting.

Wichita Branch

The Wichita Chapter of the American Electroplaters' Society held its regular meeting for February as guests of the Wichita Chapter of American Society of Metals. A joint meeting was held as it was felt that the speaker for the Society of Metals had a message that would be of benefit to all men engaged in metal processing. About 40% of our members were in attendance.

The speaker was *Dr. Clarence Bremer, Oakite Products, Inc.*, New York, whose subject was "Cleaning Aluminum Prior to Spotwelding."

Louisville Branch

The regular monthly meeting of the Louisville Branch, American Electroplaters Society was held Thursday, January 15, 1953 at Korfhages Restaurant, 1482 Preston Street, Louisville, with a dinner served at 6:45 P.M. President *Arthur A. Oertel* opened the business and open meeting at 8:00 P.M. with 32 members and guests present.

The roll call of officers was read and 1st Vice-President *P. H. Pate*,

BRIGHTER

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Increase Production

easy to control . . . cuts down on trouble that entails costly delays.

Save time

can be operated at a higher speed.

Reduce Rejects

gives unbelievable uniformity of deposit in recesses . . . brighter, white color.

Write for **FREE** *bulletin revealing tricks on improving your nickel plating and cutting costs.*

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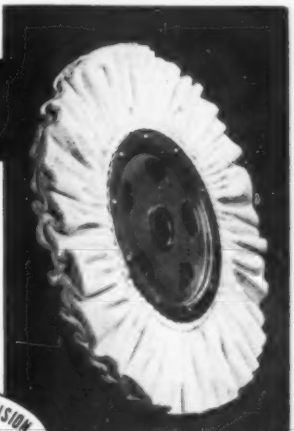

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Sargeant-at-arms *Paul DeHaven*, and Board of Managers *T. K. Allison*, *Al Steidle* and *G. A. Logsdon* were reported absent. The minutes of the previous meeting were read and accepted.

C. R. Arbegust, Chairman of the Roster Committee, reported that the temporary roster report is now completed and available to all of the members. The members who have not received their copy may get it from the secretary. It is the intention of the committee to have a revised roster report which will be available in the near future.

A letter was received from *Alfred H. Pope*, President of the Philadelphia Branch asking the Louisville Branch to support *Dr. Samuel Heiman* for the Third Vice-President of the Society at the National Convention to be held in June 1953 at Philadelphia.

A letter from *Edwin F. Ottens*, Branch Exhibits Chairman of the National Convention, asked us to participate in the branch exhibits. President A. A. Oertel placed the letter open for discussion and comments. The attitude of the Louisville Branch was that we were not prepared to submit an exhibit at this time but may do so in the future. The letter was ordered to be placed on file.

A letter from *Charles Wise*, Secretary of the Cincinnati Branch, invited the Louisville Branch to attend their Educational Session and Dinner-Dance to be held Saturday, March 28, -1953 at the Sheraton-Gibson Hotel in Cincinnati, Ohio at 2:00 P.M. The afternoon session will include waste disposal panel, job shop operation and *Ezra Blount*, editor of Products Finishing will talk on Japanese plating operations. Dinner, show and dance at 7:00 P.M.

Ed Bruck, a prominent member of the Indianapolis Branch and a very welcome guest of the Louisville Branch announced that the Indianapolis Branch will hold an Educational Session and Dinner Dance Saturday, April 25, 1953. Ed also stated that the Dayton Branch will hold an Educational Session and Dinner-Dance on Saturday April 18, 1953. It appears that the spring season has very much to offer.

President A. A. Oertel turned the meeting over to Educational Chairman, *Stanley J. Beyer*. After a brief talk, Beyer introduced *J. V. Davis* of the *Udylite Corp.*, as the speaker of the evening. Mr. Davis in his talk on "Savings by Use of a Full Automatic Machine" explained the superiority of having a machine do the cleaning, pickling, and plating operations as compared to the hand operations. It was pointed out that the timing control, the flexibility and efficiency of operation was much desired and that quality can be much better controlled than by hand operations. The load of work was much higher in production thereby reducing costs. Pictures were shown which were narrated by Mr. Davis. Considerable discussion followed and Mr. Davis was given a rising vote of thanks for a very interesting talk and picture.

J. G. Sterling,
Secretary & Treasurer

New York Branch

The meeting was called to order by President *A. Amatore*, on Friday, February 27, 1953. Roll of officers was called and George Schore and Mr. Sterling were noted absent. Nominations for new officers of the Branch

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were then proposed. The following candidates were nominated:

President—*Mr. Amatore.*

1st Vice-President—*Mr. Fusco.*

2nd Vice-President—*Mr. Hartshorn.*

Financial Secretary—*Mr. Cooperman, Mr. Veit, Mr. Maher.*

Recording Secretary—*Mr. Levinson.*

Librarian—*Mr. Cross. Mr. Veit, Mr. Stevens.*

Sergeant-at-Arms—*Mr. Briganti.*

Secretary-Treasurer—*Mr. Schore.*

Board of Managers—*Mr. Maher.*

Delegates — *Mr. MacStoker, Mr. Amatore, Mr. Schore.*

Alternates — *Mr. Herrmann, Mr. Nadel, Mr. Veit, Mr. Hartshorn.*

Educational Committee — *Mr. de Waltoff, Mr. Carlson, Mr. Nadel, Mr. Herrmann, Mr. Taub, Mr. Hartshorn.*

These nominations will again be opened prior to election on March 13th.

Mr. Nadel made a motion, and it was duly seconded, that there be a meeting called of the board of managers, together with the president, to discuss the question of the Educational Committee. There being no other business, the meeting was turned over to Mr. Veit, who conducted a Question and Answer Period.

Chicago Branch

Polishing methods employing new chemical techniques with tumbling barrels was the subject at the February 13 educational session. This interesting development in metal finishing was presented by *Art Kohler* of the *Frederick Gumm Chemical Co.* of Kearny, N. J.

The use of zinc slugs in this process represents an innovation which promises high micro finishes otherwise unobtainable in bulk metal processing.

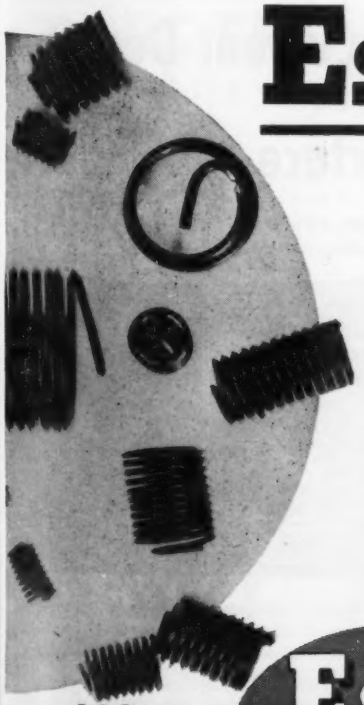
Chicago Branch nominating committee presented the following slate of officers to be voted on at the March meeting: President, *Joe Andrus;* 1st vice-president, *Elmer Olson;* 2nd vice-president, *Edward Stanek;* secretary-treasurer, *Paul Glab;* Librarian, *Russell Harr.* Delegates to be considered for election are: *Clyde Kelly,* Paul Glab and *Joe Andrus.* Alternates: *H. A. Gilbertson, Ray Ledford* and *Marion Longfield.* The proposed slate for Board of Managers includes Ray Ledford, *Art Bartman* and *Dr. Monaweck.* All Chicago Branch members were urged to attend the March meeting and take part in the election of next year's officers.

Joe Andrus is once again conducting an evening class in the techniques of electroplating at the *Illinois Institute of Technology.* Classes meet every every Monday evening from 8:10 to 9:50 P.M.

Rudy Hazucha, "Mr. Banquet," gave his committee's report on the January 31 dinner-dance. A success in every department including finances. Since Rudy seems to exceed himself each succeeding year, we sometimes wonder when the apex will be reached!

"They Were There" Department

R. E. Parkinson of Continental Can and *Lee Seabright* of Acme Steel—a "Corina" to *Russ Harr* for bringing us *Eileen Drews*—Makes us wonder how many lady members there are in A.E.S.—*Art Kohler* must have been trying for the record in round-trip time between Chicago & Kearny—had to catch the train back right after the meeting—*Bruce Belke* off again on another Eastern swing for Belke Manufacturing—too bad there were no seamstresses in attendance — *Frank Compea* and *J. C. Kretschmer* of Union Special could have told them



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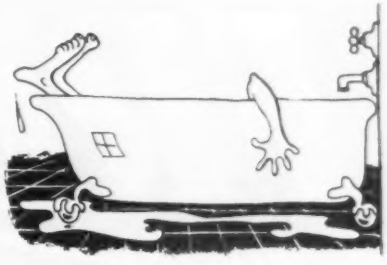

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It is advisable to place equipment orders with your supplier well in advance of scheduled use. Distributors of Inco Nickel Alloys can supply the latest information on availability from warehouse and mill.

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all about sewing machines — *Larry Rosendahl* back again after a brief absence—*Al Klomps* of Sunbeam explaining deep-fat fryers to *Jimmy Vallone*—*Norbert Sajdera* of Imperial Brass, a new attendant at our meetings —*John Kurdenok* and *Ed Zylstra* in earnest conversation—*Don Chiz* of Poray, another new comer—*Ed Wild* of R. O. Hull and *Art Engdahl* of Kocour—*Carl Buchhass* of Mall Tool and *Russ Miller* of Stewart-Warner—*Vic Wiskochil, John Benger* and *H. Gilles* of National Lock—*Clare Proudfoot* of Bastian-Blessing—and a big thank you to *Ralph Belke* and *Floyd Miller* who did all the work for this reporter while he was away.

Edward Stanek

Los Angeles Branch

Conversion coatings for zinc, zinc plating and metal preparation was the subject of a talk presented at the March 11 general meeting of Los Angeles Branch, American Electroplaters' Society at the Rodger Young Hall by *Kenneth P. Ballinger,* vice-president of the *Chemical Corporation,* Springfield, Mass.

Mr. Ballinger's remarks were aimed at the man at the plating tank—the plater, and dealt with the problems of zinc coating that the average plater encounters.

The speaker pointed out that usually it is not the complex or involved problems that cause the plater the most grief, but, as a rule, the frequent little difficulties that crop up in every day operation.

Mr. Ballinger devoted a considerable portion of the early phase of his talk to pointing out operations for which his company does *not* recommend the use of zinc. Some of these were: As a bearing surface, in which cadmium is preferable as it gives a better bearing quality than zinc; not high-heat jobs, as at 600 degrees upward zinc is inclined to cause embrittlement of steel; neither zinc nor cadmium should be used on items that come into contact with food.

The speaker cited a zinc plating cycle as follows: (1) anodic cleaning; (2) cold rinse; (3) formic acid pickle; (4) cold rinse; (5) zinc plating bath. He outlined a zinc bath that should produce a quality plate: Zinc metal, 4½ ounces per gallon; zinc cyanide, 8 ounces; total cyanide 13½ ounces; caustic, 12 ounces.

Important, Ballinger emphasized, is the relation between the zinc and the cyanide. He said he has found that for a rack plating job a ratio of 3 to 1 zinc and cyanide will keep the plater out of trouble.

Jack Bealle, president of *Crown Chemical & Engineering Co.,* Los Angeles, west coast distributor for *Chemical Corporation,* assisted Ballinger in presenting the illustrated phase of the talk.

President *Myron Orbaugh* presided over the business session. He announced that nomination and election of new branch officers had been postponed till the April general meeting. Sergeant-at-arms *George Hetz* introduced the following guests:

Don Orr, Accurate Plating Co.; *Don Baudrand,* Eldred Laboratories; *George* and *Roger Moeller,* Spartan Engineering Co.; *J. S. Baker, R. W. Lauritzen* and *R. A. Jones* of *Turco Products, Inc.; B. W. Wambacher,* Spartan Engineering Co.; *Fred Aves,* Aves Electric Co.; *Edward Delameter,* Brigantino Laboratories. Introduced by Hetz as "semi-guests" were *Ed Wells* of the *L'Hommedieu Company* and *Dick Hallden* of Tool & Jig Plating Company, who made their first

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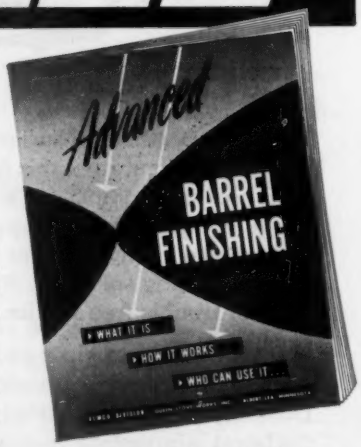

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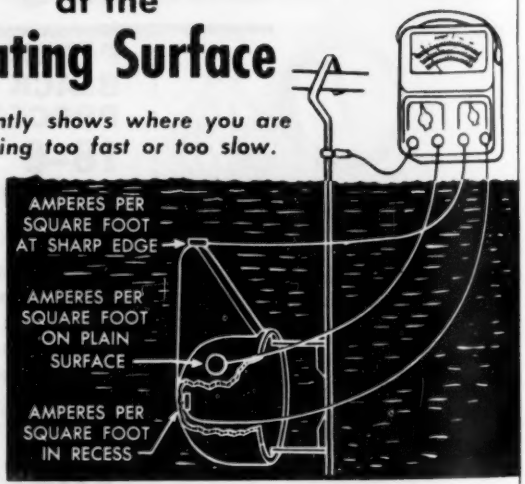

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appearance at a branch meeting in several months.

Nine applications for membership were received and will be acted upon at the April meeting. The applicants were *D. J. Collier, Jr., Willard C. Heinicke, I. E. Kort, Ira Edwards, Burt W. Wambacher, Harry J. Reedy, Norris Freeman, Warren Davis* and *Marshall Hubb.*

Progress reports on the branch's March 21st annual educational session were given by General Chairman *George Hetz*, and sub-chairman *John Millhorn* (entertainment), *Stuart Krentel* (technical sessions), *Fred Raymond* (reservations), and *Larry O'Neill* (door prizes).

CHICAGO ELECTRO-PLATERS INSTITUTE

Lawrence J. Hay, president of *Plating Service Co.*, Chicago, was elected chairman of the *Chicago Electro-Platers Institute* at its 18th Annual Meeting. He succeeds *Carl F. Hansen, Advance Tinning Co.*, Chicago.

Mr. Hay distinguished himself during his term as vice-chairman by heading the Institute's Exhibit Committee for the Industrial Finishing

Lawrence J. Hay

Exposition of 1952. He is a member of the *American Electroplaters' Society* and well known for his untiring efforts in support of the metal finishing industry.

The Institute, which represents 100 custom electroplating shops in the Chicago trade area, also elected *Charles E. Jensen, Jensen Plating Works*, vice-chairman and *Robert L. Giesel, Adolph Plating, Inc.*, secretary-treasurer. Elected to the board of directors were: *William G. Bott, Aetna Plating Works; Michael Mitchell, Grunwald Plating Co.; John Lietz, B. Mercil & Sons Plating Co.; Dominic Pacenti, Metal Processing Co.; R. V. Leonardson, Micro-Deburring Co.*; and past chairman, *Hansen.*

THE ELECTROCHEMICAL SOCIETY

The Electrochemical Society will hold its 103rd meeting at the Statler Hotel, New York City, from April 12 to 16, 1953.

Sessions are scheduled on: Electric Insulation; Electronics — Luminescence, Rare Metals, Phosphor Screen Application, and Semiconductors; Electro-Organic Chemistry; Electrothermics; and Theoretical Electrochemistry. The program lists 135 papers for the four days of technical sessions.

The Theoretical Electrochemistry Division has arranged a special Symposium on Application of Electrochemistry to Biology and Medicine, with 25 papers by eminent authorities in the field.

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STRAIGHT & 45° "SPOKE-BUFFS"
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THE GALVANIZERS COMMITTEE

The Galvanizers Committee, which is sponsored by the *American Zinc Institute,* will hold its twenty-ninth meeting in St. Louis, Missouri, on April 27-28, 1953, according to chairman *B. P. Finkbone,* of Armco Steel Corp.

F. F. Aloi, Metallurgical Engineer, Bethlehem Steel Co., heads the program committee for the occasion, which will be held at the Hotel Statler coincidentally with the annual meeting of the American Zinc Institute previously announced.

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Gallon Cap.	Inside Diam.	Inside Height	List Cost
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15	15"	20"	15.00
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